ENGINEERING AND MINING JOURNAL

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NOVEMBER 1955

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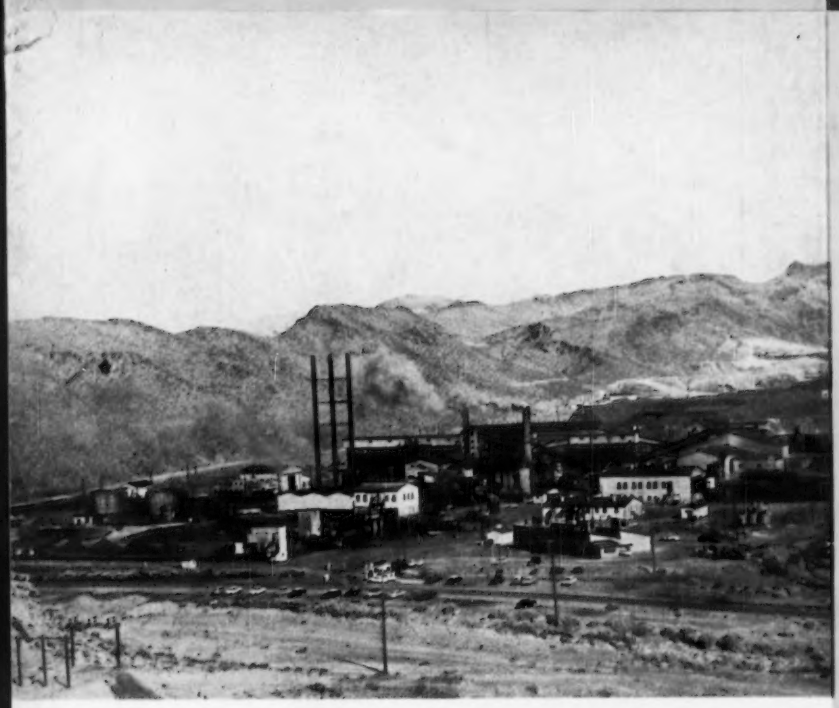

How Manganese Inc. Upgrades Complex Ore

An ingenious flowsheet turns a manganese operation into a money maker. P 88

What's The Thorium Situation Today?

Everybody is wondering — Here, for the first time, is a comprehensive answer. P 75

Mining Congress Hits Las Vegas

(Or vice versa) — Highlights of the meeting in case you couldn't make it. P 100

Mechanized Mining of a Needed Nonmetallic

North America's largest gypsum mine swings into production. P 84

Is Tungsten Mining Child's Play?

See how these boys have developed and mined a tungsten properly for fun and profit. P 97

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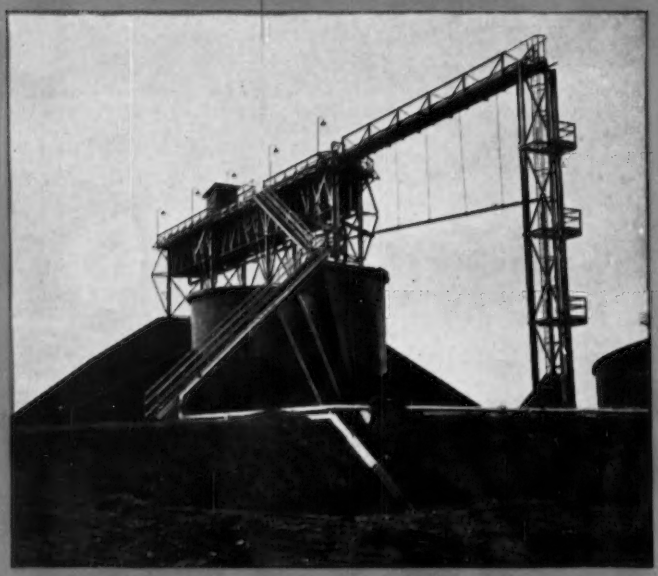
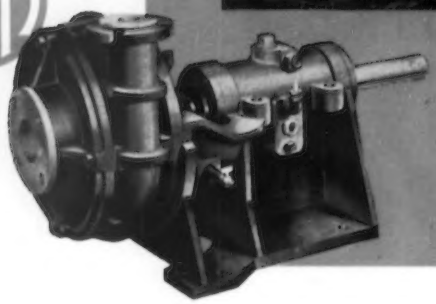
How sand screenings are lifted to classifier at modern plant of the Glacier Sand & Gravel Company



Sand classifier at Steilacoom deposit on Puget Sound. Designed by Henry J. Kaiser engineers. Bunkers are formed by serpentine and straight-wing walls.



In solution of 30% solids, the minus-3/16" screenings are pumped by two Hydroseals in series from a sump to the classifier for settling into four sizes—plaster, paving, building and No. 48 sand, and occasional super-fine. Maximum head, 65 ft. Rate, 2,500 gpm.

If you are moving abrasive material of 35 to 4 mesh, you'll do it better with Hydroseal Sand Pumps. Because their close clearances are protected by seal liquid, they'll hold their initial high efficiency up to the moment a long-wearing Maximix Rubber part needs replacement. Since you never need an oversize Hydroseal & motor as allowance for wear, you'll save ⅓ to ½ in power costs. Write us.

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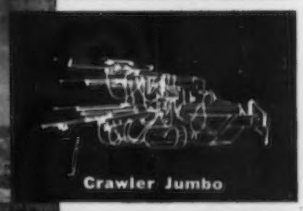

no matter HOW BIG or how small the drilling job

you can do it faster and easier with an I-R HYDRA-BOOM JUMBO

THE giant, octopus-like drill jumbo above was supplied by Ingersoll-Rand for a large shaft-sinking job. Carrying six heavy, boom-mounted I-R drills, each with individual, fingertip control, it is lowered down the shaft as drilling progresses — virtually eliminating setup time and giving maximum footage per shift.

Other typical Hydra-Boom jumbos, manufactured by Ingersoll-Rand Co. are shown above right and illustrate the *unlimited flexibility* of these fast-acting, hydraulically-operated drill mountings. Use them on large jobs or small — for smooth, effortless hole spotting. Let us help you engineer your unusual drilling problems. For the complete, cost-saving story, write today for Bulletin No. 4162.

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ENGINEERING AND MINING JOURNAL

89th YEAR OF PUBLICATION

VOL. 156 No. 11

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LETTERS

Uranium Fever

Have been a reader of *Engineering & Mining Journal* a good many years and have enjoyed every issue of it. Just now, like a lot of others, I am trying to get into the uranium game—and what a game. The old time prospector that salted a gold mine to make a sale was a piker. These uranium prospectors with their geiger counters and jeeps have more tricks up their sleeves than an old timer like me ever dreamed of. Most of them don't even use a geiger counter. They are too busy staking goat pasture to peddle to some unsuspecting tenderfoot or keeping a close watch so they can move some "floating claims" to better territory. Mining laws here don't mean a thing. I believe San Juan County has been staked at least three times and it is still going on. The attorneys are sure going to get fat. Have heard some claims have changed hands two or three times before the last "owner" woke up to the fact the original "seller" didn't own the claims in the first place.

Along with the above the prospector has other troubles. With more than two years of it behind me I should be able to qualify as an expert on the subject.

A. A. Barr
Blanding, Utah

He's alive... and you helped

People still die from tuberculosis—this year one American every twenty-seven minutes!

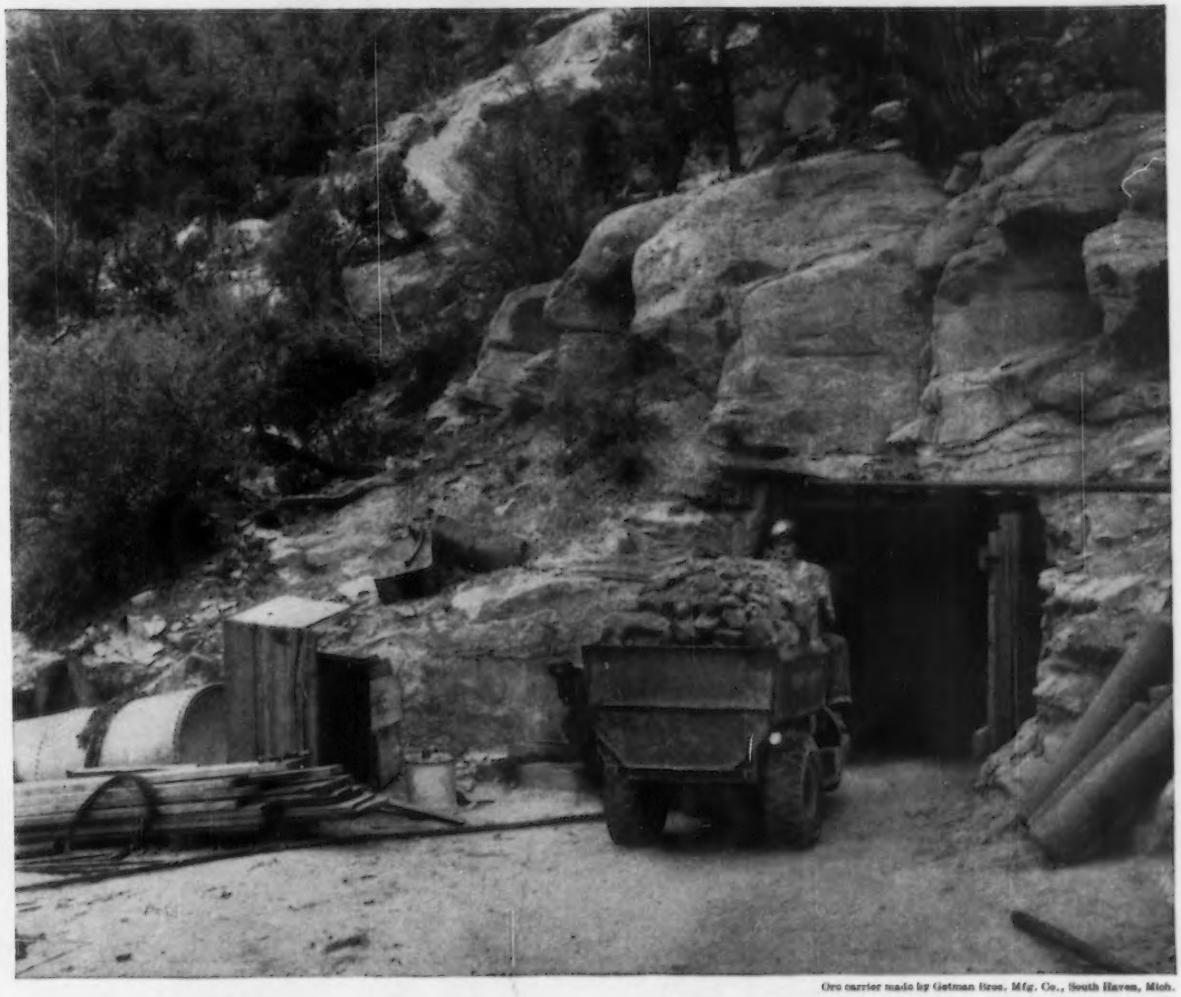
Yet the money which you give for Christmas Seals has helped to save thousands of lives.

Christmas Seals fight tuberculosis year-round—through education, case finding, patient rehabilitation, and research.

Make Christmas Seals a part of *your* holiday giving, today.

Buy and use Christmas Seals

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Ore carrier made by Getman Bros. Mfg. Co., South Haven, Mich.

Here comes uranium for the atomic submarine

A typical example of B. F. Goodrich improvement in rubber

OUT of that hole comes the powerful stuff that will make atomic fuel. Climbing up the narrow, twisting tunnels of the uranium mine are trucks so small and compact that there's no room for clutch and gears. Instead they use V belts to run them. But for a while this type of truck wasn't practical because the belts kept breaking. They sometimes lasted only a few days.

All kinds of belts were tried but they couldn't stand the jolting starts and stops, heavy loads, rough driving. Some would snap like pieces of string.

Then the manufacturer heard about Grommet belts invented by B. F. Goodrich engineers. The grommets are two extra strong cord loops inside the belts, like twisted cables except they're endless. High-capacity Grommet belts were put on the trucks. They're so much stronger they last months instead of days.

Product improvement like this is *always* going on at B. F. Goodrich. New ways are constantly being found to make V belts, conveyor belts and hose work better, last longer. No product is ever regarded as "finished" or standardized.

How this cuts your costs: Biggest cost savings come almost always from top performance rather than lowest prices. If you use rubber products, remember B. F. Goodrich is one company that will *never* lower its quality standards. This means you can be sure of top performance and real money savings when you buy from your B. F. Goodrich distributor. *The B. F. Goodrich Company, Dept. M-482, Akron 18, Ohio.*

Grommet—T. M. The B. F. Goodrich Co.

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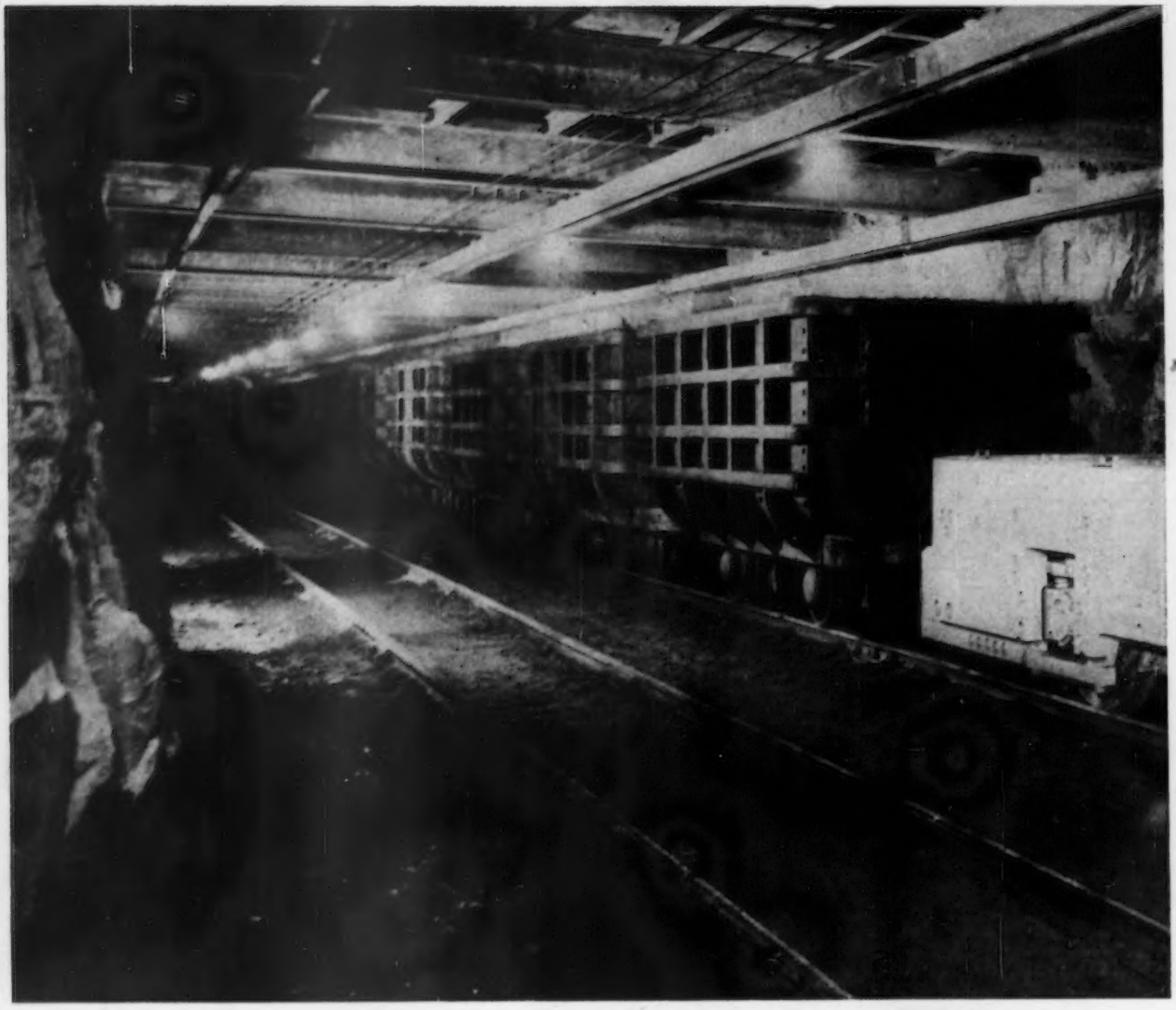
INDUSTRIAL PRODUCTS DIVISION



Even the longest

WHEN YOU lubricate mine car wheels with *Texaco Olympian Grease,* you get easier, smoother starts the year 'round — no matter how heavy the loads. That means your locomotives can haul longer trains, more tonnage.

Texaco Olympian Grease assures low maintenance costs, too. It is especially made to stay in the bearings under all conditions. Thus, bearings get an extra measure of protection against dirt, moisture and wear. Moreover, *Texaco Olympian Grease* effectively resists oxidation, will not separate in use or storage.

Texaco Olympian Grease is available in three consistencies — to meet every requirement of plain, cavity hub or anti-friction bearings.

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TEXACO STAR THEATER
starring
JIMMY DURANTE
on television . . .
Saturday nights, NBC.

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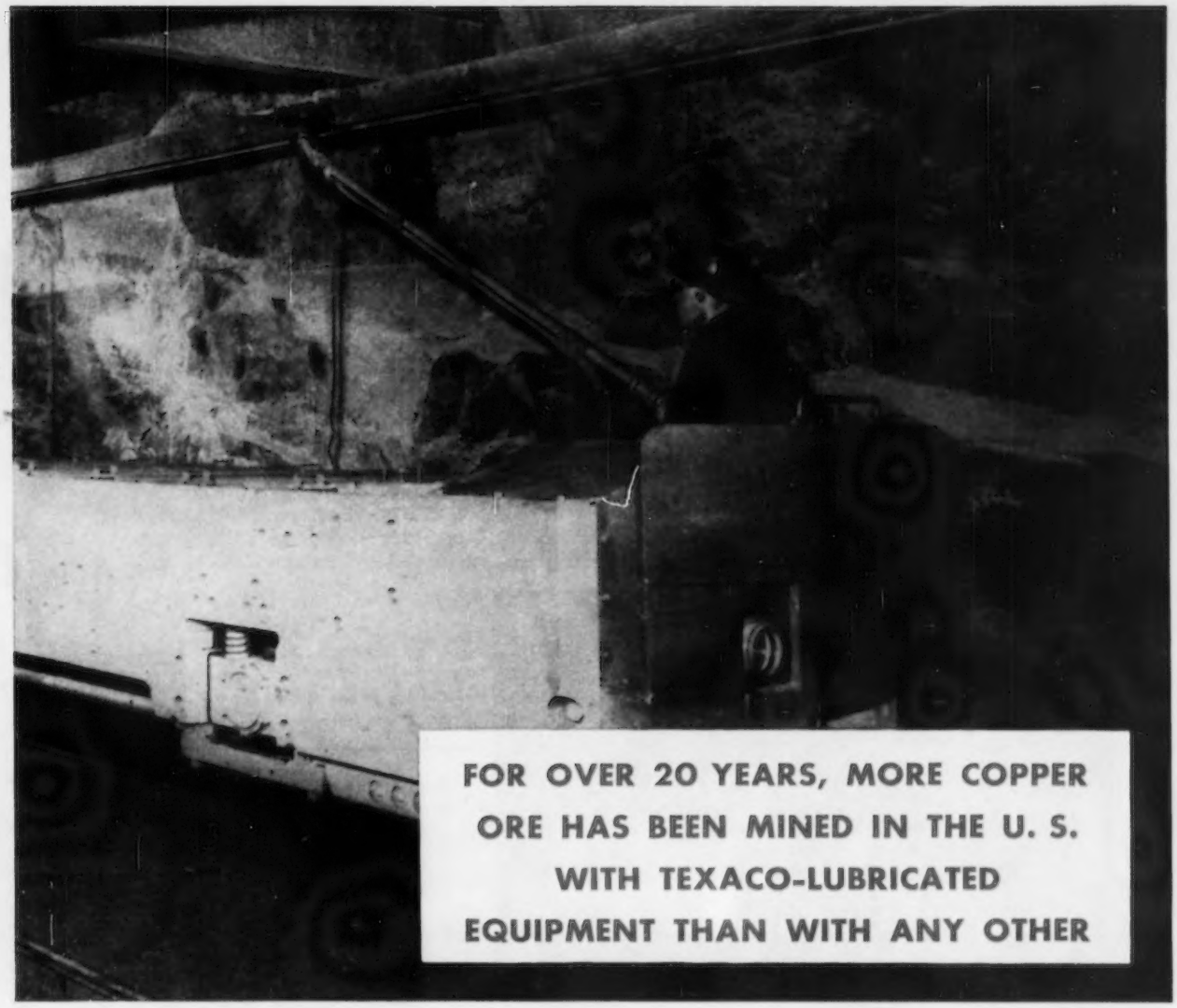

trains start easier...

For the best in wire rope and open gear lubrication, use *Texaco Crater.* Its full protection for strands *and* core keeps wire rope strong longer—its ability to cushion shocks and heavy loads prolongs gear life. For easier application on both wire rope and gears, use *Texaco Crater X,Fluid.*

High efficiency and low costs can be yours with the help of effective Texaco lubrication. Get full details from a Texaco Lubrication Engineer. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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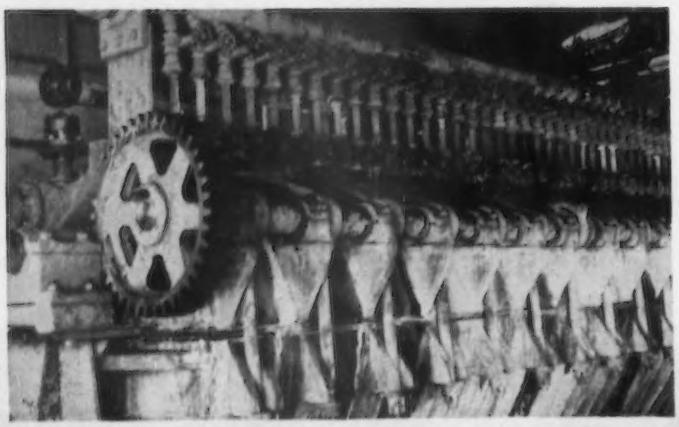
FOR THE MINING INDUSTRY

AT

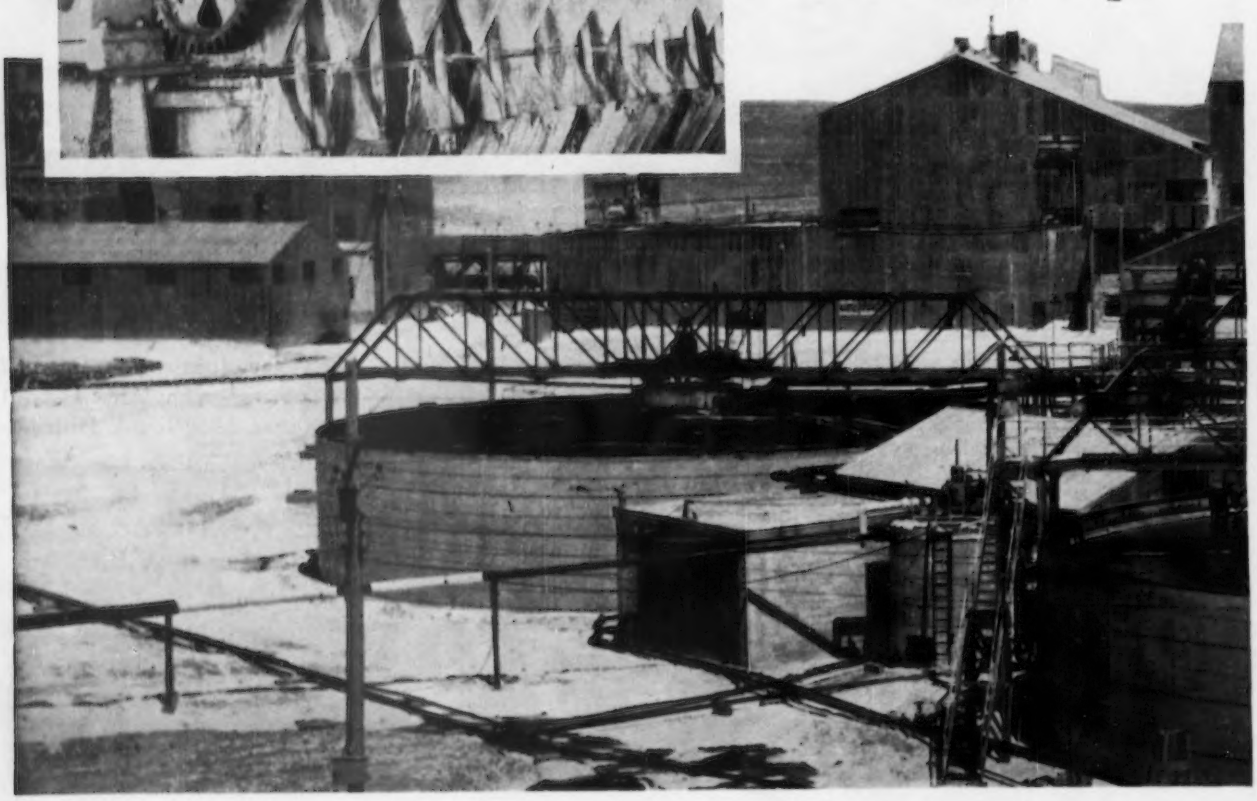
INTERMOUNTAIN CHEMICAL COMPANY...

(OPERATED BY WESTVACO CHLOR-ALKALI DIVISION, FOOD MACHINERY & CHEMICAL CORPORATION)



Closeup of one of the six Sweetland Filters.

General view of plant with three Dorr Thickeners in foreground.



The vast trona deposits throughout the Green River, Wyoming, area represent an assured supply of soda ash for expanding western industry. But before calcination, insolubles amounting to approximately 10% must be removed by physical means. And here Dorr-Oliver equipment and methods play a vital role.

At Intermountain Chemical Company's Green River Processing Plant, trona ore is crushed, screened and dissolved in mother liquor and a small amount of makeup water. Solution is then clarified in two 80′ dia. Dorr Thickeners. Underflows are washed free of entrained salt in a third Dorr Thickener. Combined overflow from the three Thickeners is a sodium sesqui-carbonate solution which is polished on six #12 Sweetland Filters. The Sweetlands are of cast iron construction with 72 leaves each providing a total filter area of 6024 square feet. After polishing, the solution is concentrated in triple effect vacuum crystallizers. The resulting crystals are thickened in two 30′ dia. Dorr Units and are then calcined to soda ash. Operated by Westvaco Chlor-Alkali Division of Food Machinery and Chemical Corporation, the plant has a capacity of 350,000 tons per year.

For the Process Industries, Dorr-Oliver offers a complete and integrated service. Well-designed equipment, as installed at Intermountain Chemical, is an important part of this service. But if your processing needs involve laboratory and pilot plant testing, flowsheet preparation, economic analysis or complete plant design and construction, we can also be of help. For a complete picture of the scope of the Dorr-Oliver technical service write for a copy of Bulletin No. 7003. Dorr-Oliver Inc., Stamford, Connecticut.

Sweetland — T.M. Reg. U. S. Patent Office

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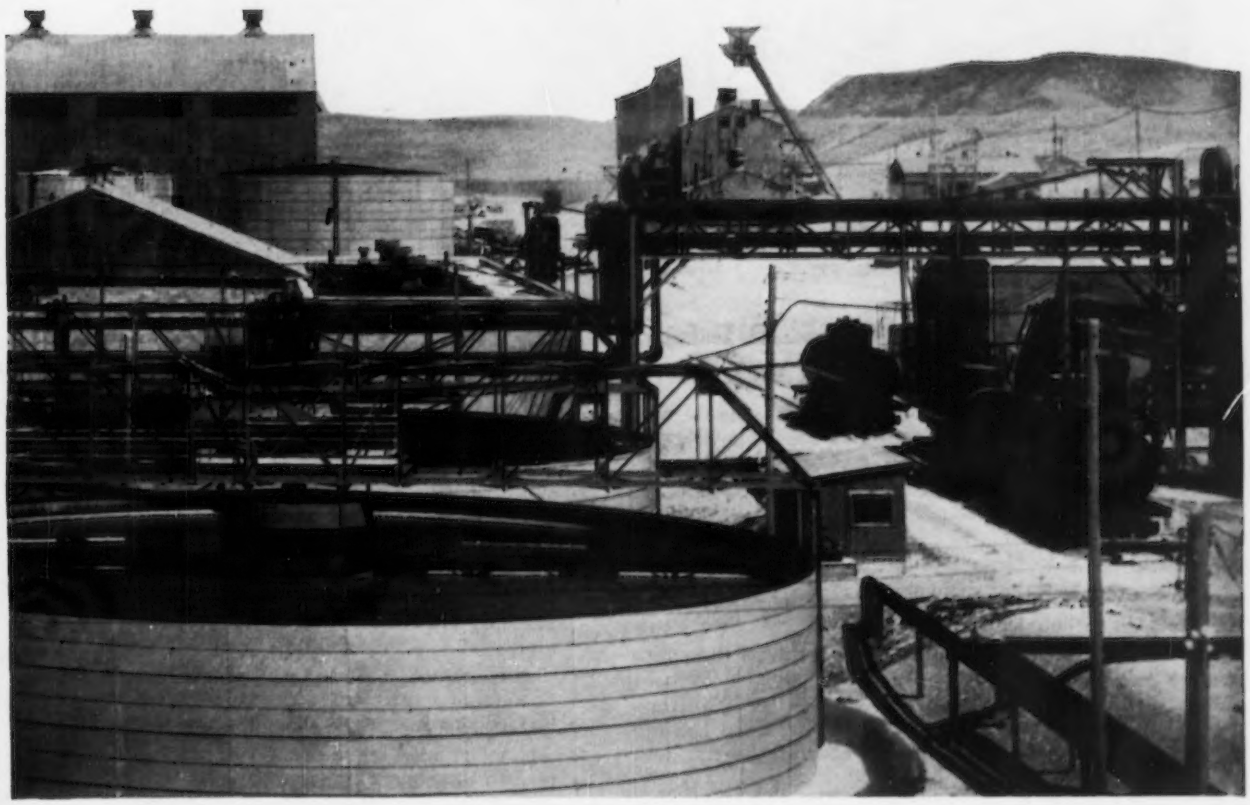


more performance . . .
FOR SUSTAINED HIGH OUTPUT!

more versatility . . .
FOR A WIDER RANGE OF WORK!

more dependability . . .
FOR LOWER JOB COSTS!

TWO NEW

HD-6

BULLDOZER-DRAWBAR TRACTOR

Weight	12,400
Drawbar hp	45
Belt hp	55

STEP UP PERFORMANCE, CUT JOB COSTS WITH EXCLUSIVE HD-6 FEATURES LIKE THESE...

★ Allis-Chalmers heavy-duty diesel engine — with "follow-through" combustion for long life, low upkeep.

★ 24-volt direct electric starting — for convenience and efficiency (standard equipment).

★ Wrap-around radiator guard for maximum strength and protection . . . tilts forward for easy service.

★ *Ceramic* master clutch lining — lengthens clutch life, reduces lever pull.

★ All-steel box-A main frame — protects the entire power train, makes possible superior balance . . . plus the service simplicity of unit construction.

★ One-piece steering clutch and final drive housing — for maximum strength, accurate bearing and gear alignment.

★ Double reduction final drives (straddle-mounted on tapered roller bearings) provide maximum ground clearance.

★ Roller bearing truck wheels — with Positive Seals that keep dirt and moisture out . . . grease in.

★ 1,000-Hour lubrication intervals for truck wheels, idlers and support rollers.

★ Tru-Dimension tracks — with new standards of strength and hardness *throughout* for extra wearability.

★ Unit construction — major assemblies like engine, clutches and final drives can be removed without disturbing adjacent parts.

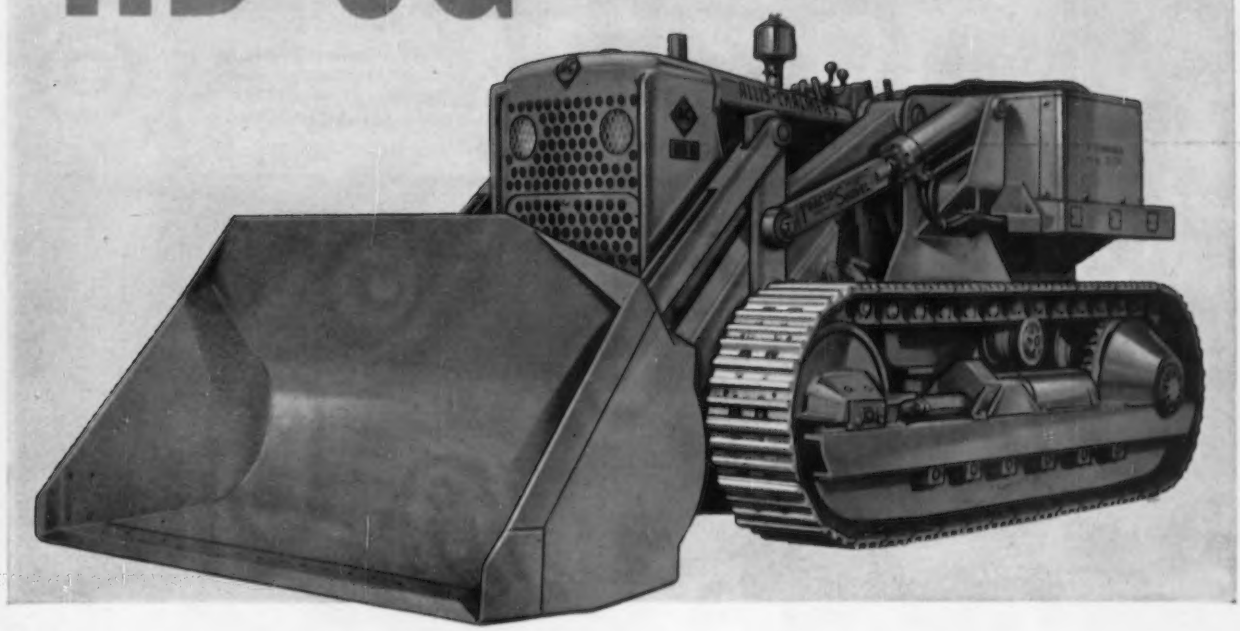
★ Engine-mounted bulldozers — for top dirt-moving performance and extra tractor life.

ALLIS-CHALMERS ANNOUNCES
HD-6 SERIES TRACTORS

HD-6G

TRACTOR SHOVEL

Weight	19,600
Drawbar hp	45
Net engine hp	57
Bucket capacity	1-1/3 cu yd



...PLUS TRACTOR SHOVEL FEATURES LIKE THESE...

- ★ Extra long track (almost 7 ft on the ground) with six truck wheels per side — for real stability throughout the digging and loading cycle.
- ★ New two-position bucket — for easy full-capacity loading in any material (standard equipment).
- ★ Heavy-duty shovel assembly — built right into the tractor, not just an attachment.
- ★ Simple, safe hydraulic system — with no exposed hoses or fittings on cowl or deck.
- ★ Two-speed reverse, high foam-rubber seat and easy bucket control — for new tractor-operator efficiency.

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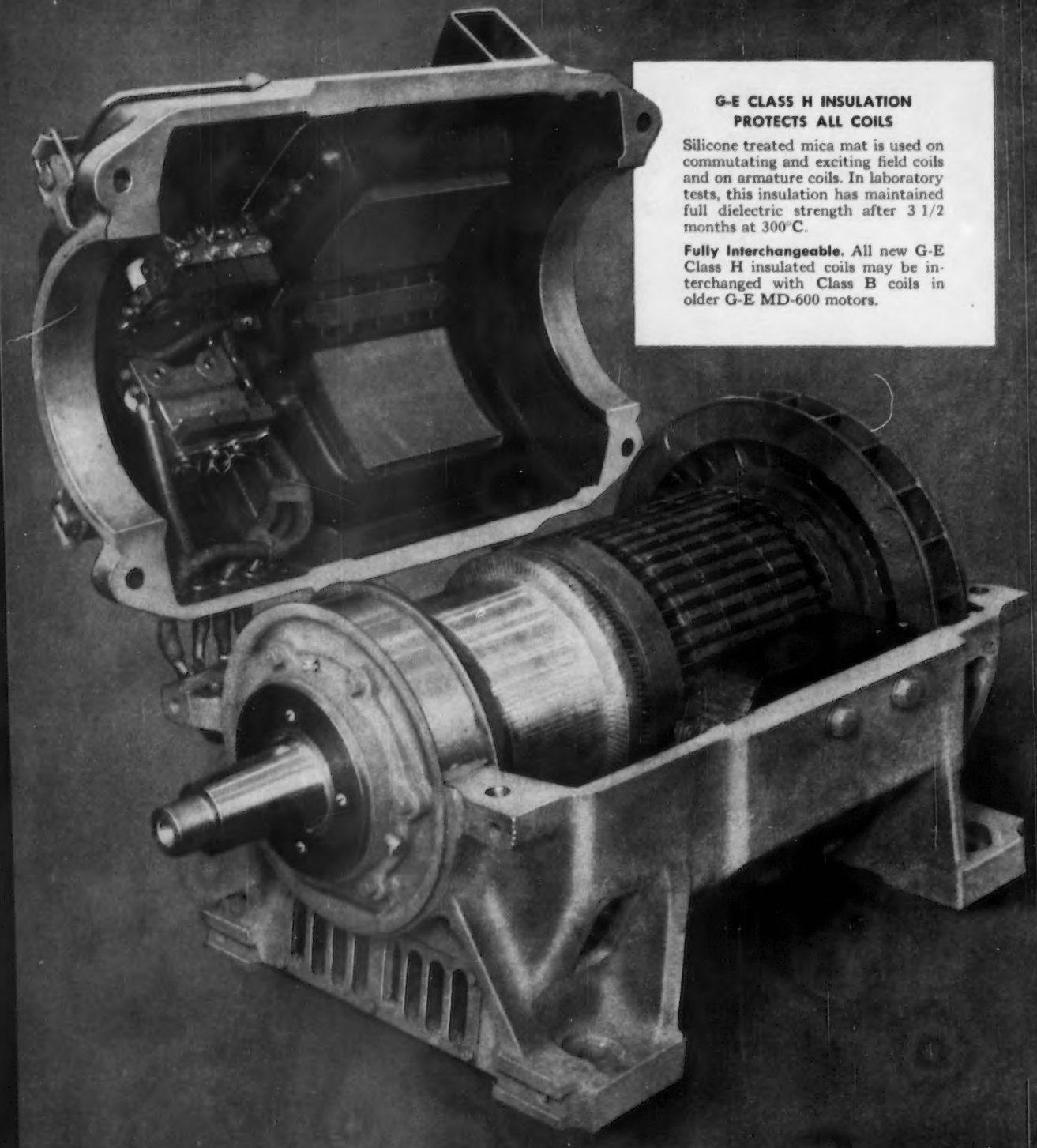
DIRECT-CURRENT DRIVES

NOW! Roastouts

NEW G-E MD-600 MOTORS



G-E CLASS H INSULATION PROTECTS ALL COILS

Silicone treated mica mat is used on commutating and exciting field coils and on armature coils. In laboratory tests, this insulation has maintained full dielectric strength after 3 1/2 months at 300°C.

Fully Interchangeable. All new G-E Class H insulated coils may be interchanged with Class B coils in older G-E MD-600 motors.

Virtually Eliminated on . . .

WITH CLASS H INSULATION

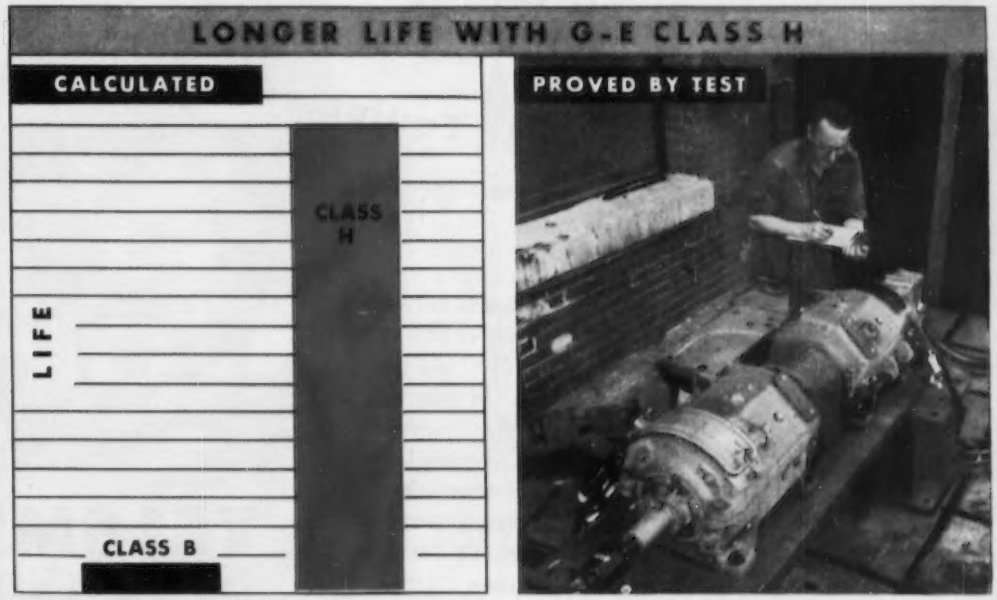
G.E. offers—in all MD-600's—Class H Insulated Coils

WHAT IS CLASS H? General Electric research has developed a combination of inorganic and silicone materials for a new insulation system now used in all MD-600 motors. These Class H materials will withstand temperatures up to 180°C continuously.

BETTER FOR HEAVY DUTY. Auxiliary mill motors often encounter unexpected high ambient temperatures, unforeseen extended duty or emergency conditions. Any one of these can cause "roastouts" from temperatures higher than the insulation capacity. The new G-E Class H insulation will resist up to 50°C more than Class B, resulting in longer motor service.

REWINDS ELIMINATED? On normal duty, insulation failure may be eliminated as the limiting factor in continuous armored motor service. Engineers calculate that each 10°C rise in temperature reduces the life of a given type of insulation by half. *Since G-E Class H will withstand 50°C higher than Class B, its life* **at the same temperature** *should be increased 2^5 or 32 times!*

YOUR G-E SALES REPRESENTATIVE HAS COMPLETE INFORMATION. Contact him at your nearby G-E Apparatus Sales Office, or write Section 812-1, Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania.

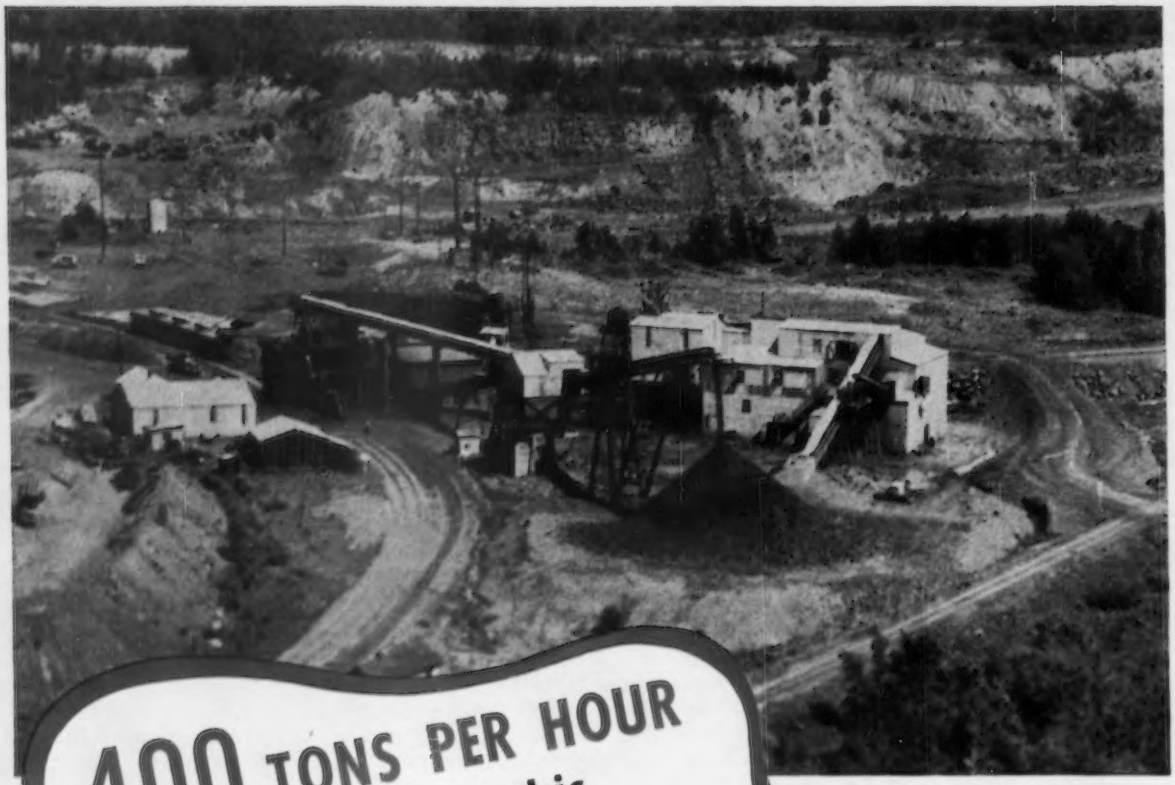


ENGINEERING STUDIES indicate that under identical operating conditions new G-E Class H insulated coils in MD-600 motors will last up to *32 times* as long as conventional Class B coils. Insulation failure may be eliminated as the limiting factor in continuous auxiliary mill motor service.

ACTUAL TEST with Class H and Class B motors coupled together *proves to date* the new insulation will last more than twice as long as the old. After burning out two Class B insulated motors, the one with Class H coils is still operating under exaggerated load, vibration and atmospheric conditions.

Progress Is Our Most Important Product

GENERAL ELECTRIC



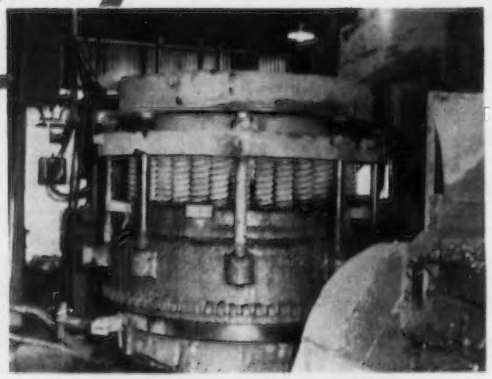
Custom mill of Skubic Brothers, Virginia, Minnesota.

400 TONS PER HOUR processed in this custom mill with TELSMITH Equipment

● Processing low grade and other ores, this Minnesota mill has a total capacity of 350-400 tons per hour. About 40% is 4″ to plus 1¼″ and goes to a 48-S Telsmith Gyrasphere Crusher. Its long, high speed crushing stroke gives maximum capacity. Its spherical head makes a uniformly finer product. Cam-and-Lever crushing action, with roller bearings, and other Telsmith mechanical advantages keep power and maintenance expense down, result in very lowest crushing cost per ton.

● Material not crushed, about 60%, is minus 1¼″ and goes to a high capacity 96″ Telsmith Super-Scrubber which turns out remarkably clean ore at minimum cost.

● Get Bulletin 266.



TELSMITH GYRASPHERE CRUSHERS

Min. 37

SMITH ENGINEERING WORKS

502 E. CAPITOL DRIVE **MILWAUKEE 1, WISCONSIN**

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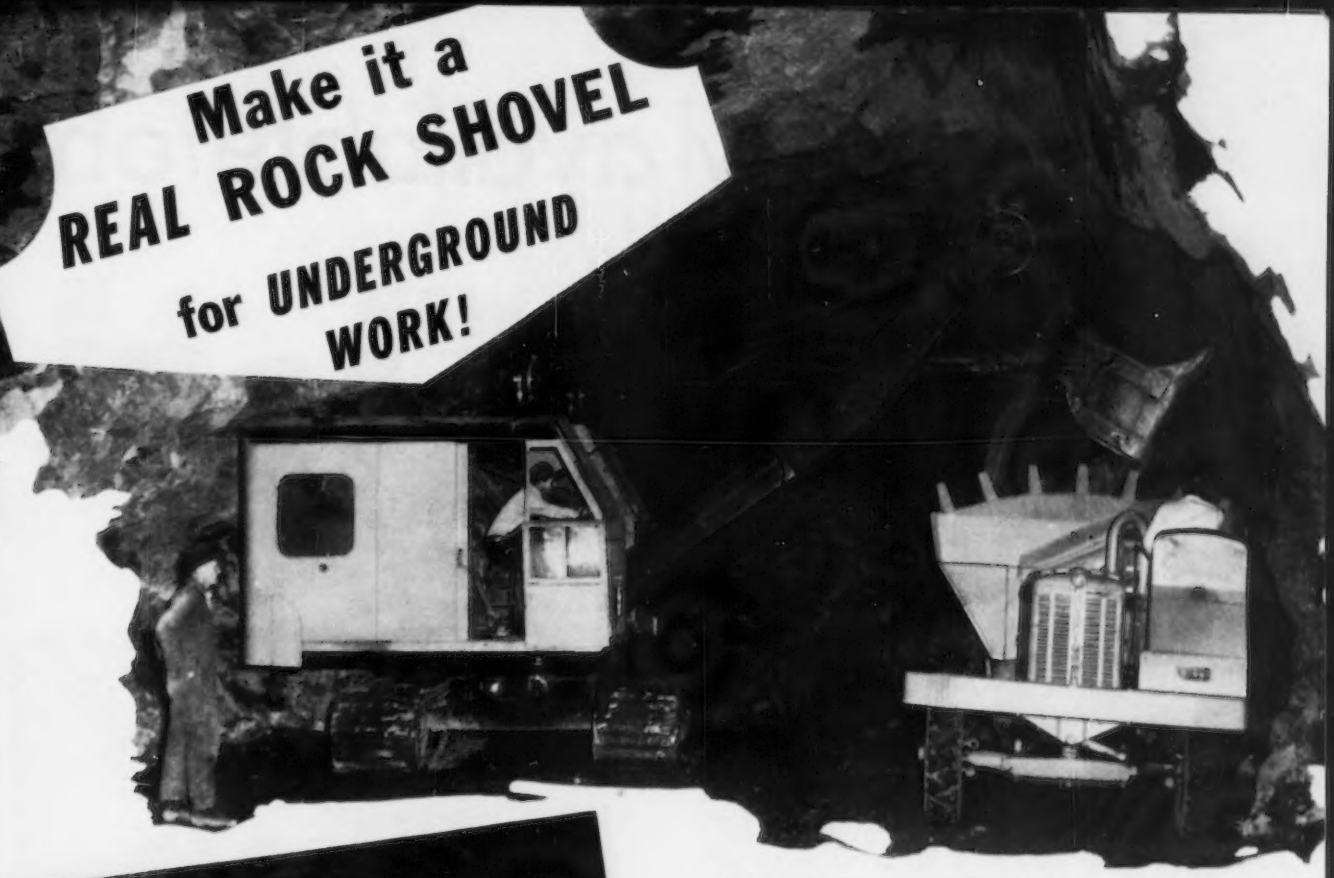
Make it a REAL ROCK SHOVEL for UNDERGROUND WORK!



NORTHWEST ADVANTAGES will mean even more underground, where smoothness and accuracy of handling takes on greater importance than on the surface.

On jobs like these the "Feather-Touch" Clutch Control frees you from the complications of delicate pumps and compressors which often require special knowledge for adjustment. Uniform Pressure Swing Clutches eliminate the jerks and grabs that delay spotting the load and reduce output. The Northwest Dual Independent Crowd utilizes force most independent crowd shovels waste. It's a clean cut into the bank — no stutter — no restarts — no dipper juggling! Simplicity of design makes upkeep easy in underground conditions which may often be tough and Northwest steering gives easier maneuvering in the close quarters of tunnel work.

These are just a few of the Northwest features that have proved a Northwest to be a *real hard* Rock Shovel underground as well as in surface pits. Ask for more details. There is a Northwest Man near you.

NORTHWEST ENGINEERING COMPANY
1509 Field Building, 135 South La Salle Street, Chicago 3, Illinois

DIESEL or ELECTRIC

Has Your Shovel Stood the ROCK TEST

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

Now available on

Hydrostart

IF you're running a General Motors Detroit Diesel far from civilization—or in extremely cold weather—here's a new low-cost hydraulic starting system that insures fast starts every time.

This Aeroproducts Hydrostarter spins a Diesel fast, has no parts or components that require regular replacement, costs less to maintain than electric starting systems.

It sells for a lower price than any other nonelectric Diesel starter.

And it's available today from your General Motors Diesel distributor.

EASY TO INSTALL SIMPLE TO MAINTAIN

Your GM Diesel distributor or dealer can quickly install the Hydrostarter on your Detroit Diesel engines. The system is simple. All it takes is a few hours' time for installation, and arrangement of some of the components is optional.

With a Hydrostarter on your Detroit Diesel you'll free yourself from the usual starting problems. The system is completely self-contained—normal routine maintenance checks are all the care it ever needs.

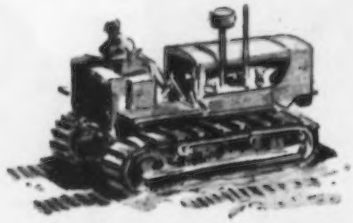
HOW IT WORKS

Heart of the system is a hydraulic starting motor operated by oil under high pressure. An engine-driven pump builds up and maintains pressure in a piston-type accumulator.

To start a General Motors Diesel equipped with a Hydrostarter, the operator opens a simple control lever to admit this oil to the motor which spins the engine. The control lever also completely engages the starting motor's gears with the flywheel before operation.

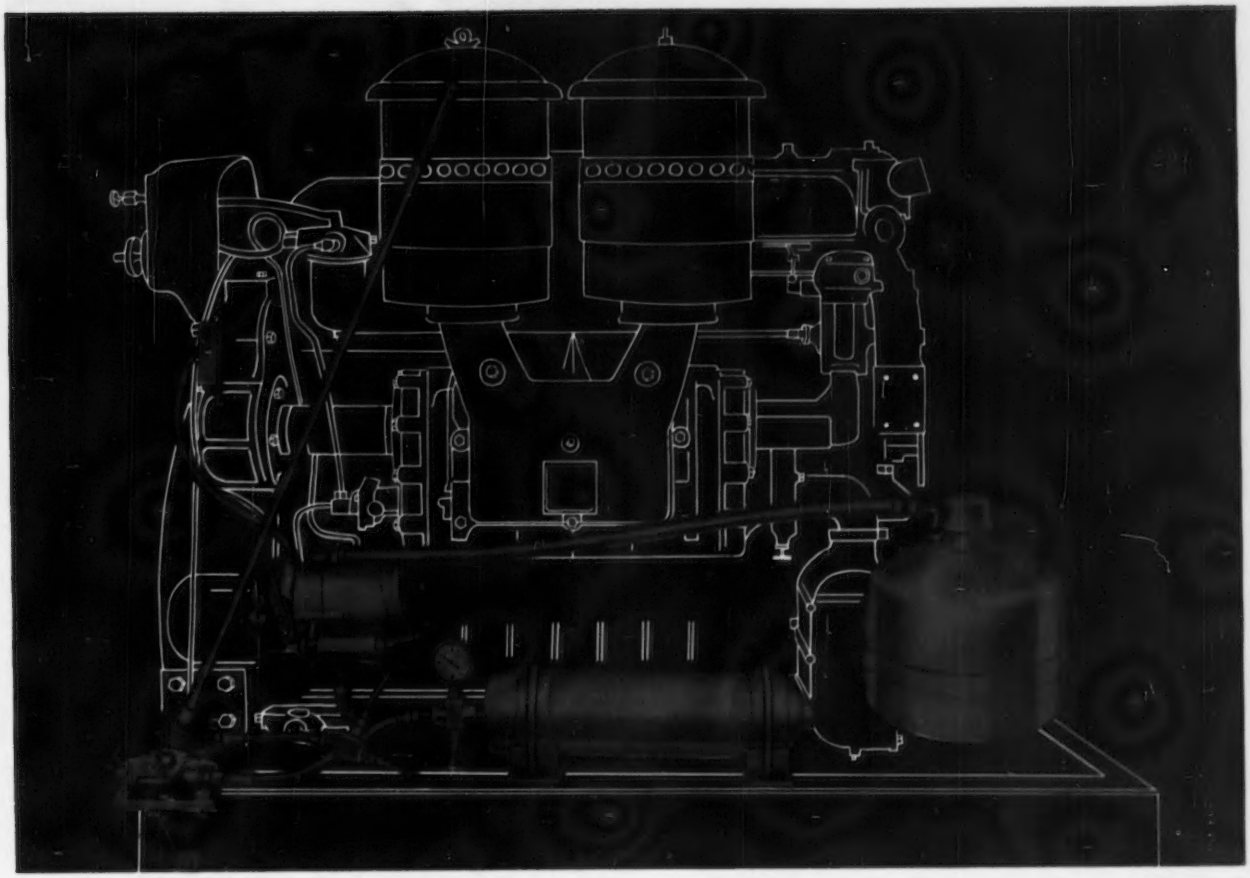
Your mechanics will get good use from the hand-operated pump which can be used to rotate the engine's flywheel slowly for timing adjustments. This pump can also be used to raise pressure if needed. The oil supply is stored and filtered in a reservoir.

Right now—before winter sets in with a vengeance—is the time to see your GM Diesel distributor about the new Hydrostarter. He can quickly install this new starting system on your Detroit Diesel engines—or can give you full information on the new Hydrostarter.



Detroit Diesel Engines—

er NEW LOW-COST HYDRAULIC STARTING SYSTEM



DETROIT DIESEL

ENGINE DIVISION OF GENERAL MOTORS

America's Largest Exclusive Builder of Diesel Engines

Single Engines . . . 30 to 300 H. P. *Multiple Units . . . Up to 893 H. P.*

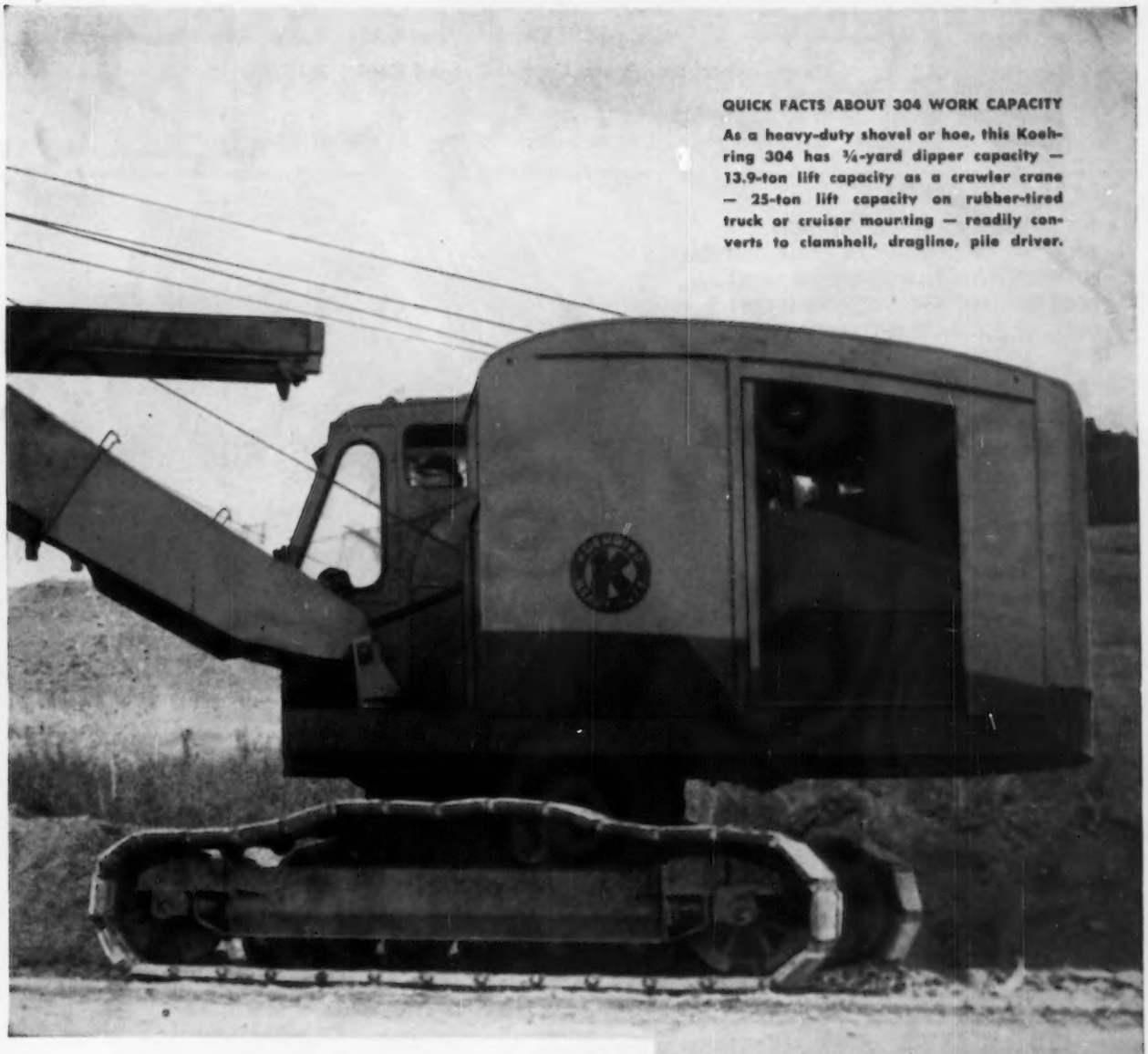
GM GENERAL MOTORS DIESEL POWER

FAST PRODUCTION TEAM *for off-road hauling . .*

You get high-speed production on both excavating and hauling, when you team Koehring fast-shuttling Dumptors with Koehring heavy-duty shovels. Notice on the operation shown here how Dumptor spots in close under the Koehring ¾-yard 304 — keeps shovel swing short. Square body opening provides a big, easy-loading target — can be loaded over either end or side.

Shuttling back and forth between the shovel and the dump area, Dumptor travels round trip without turning. Constant-mesh transmission gives the same travel speeds in either direction — saves at least 2 slow turns on every haul cycle. This heavy-duty 6-yard hauler has better than 6 h. p. per ton of loaded weight — accelerates fast, pulls through soft ground and up grades with less shifting, climbs 24% grades fully loaded. One-second gravity dumping also saves time on every cycle. There's no 15 to 25-second wait for slow-acting hydraulic or electric body hoists — no expensive body hoist maintenance. What's more, gravity-dump never balks, never wears out.

Now, take a quick look at the other half of this heavy-duty team — the Koehring ¾-yard shovel. Its powerful digging crowd and fast swing are backed up by plenty of weight-stability to hold solidly to the grade. Automatic take-up and release of tension on the crowd chain assure maximum dig-in power at every boom angle. For all its powerful application, Koehring 304 booster clutch requires only ⅓ to ½ the lever pull of a straight manual clutch — yet retains accurate "feel" of load. Instantaneous dipper



QUICK FACTS ABOUT 304 WORK CAPACITY

As a heavy-duty shovel or hoe, this Koehring 304 has ¾-yard dipper capacity — 13.9-ton lift capacity as a crawler crane — 25-ton lift capacity on rubber-tired truck or cruiser mounting — readily converts to clamshell, dragline, pile driver.

. . heavy-duty digging

trip that works every *time* is another of many Koehring features that step up shovel cycles, and give you more production every shift.

Consider what this combination of Koehring excavators and Koehring Dumptors can mean to you in overall operating efficiency, economy — and in time-saving convenience when you standardize on *one make* of equipment for all of your excavating and hauling. Get more information on Dumptors® and on the 5 sizes of Koehring heavy-duty excavators from your Koehring distributor today — or send for catalogs.

KOEHRING COMPANY

Milwaukee 16, Wisconsin

Subsidiaries: PARSONS · KWIK-MIX · JOHNSON

K539

ROEPRENE PG and PCG CABLES

(Power Ground and Power Control Ground Cable)

YOU WANT

- *THE EFFICIENCY AND INSTALLATION ECONOMY OF GENERAL-USE CABLE THAT CARRIES ELECTRICITY FOR POWER **AND** HAS BUILT-IN PILOT CONTROL AND GROUNDING CONDUCTORS FOR INCREASED SAFETY,*

PLUS

- *EXTRA-FLEXIBLE CONDUCTORS;*
- *COLOR CODING FOR PHASE IDENTIFICATION;*
- *THE OUTSTANDING TOUGHNESS AND DURABILITY OF ROEPRENE OUTER JACKETS...*

IN SHORT,

YOU WANT

ROEBLING

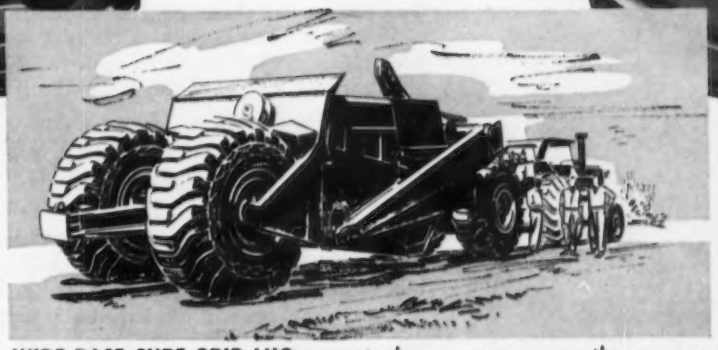
Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 11-15 STILLING ST. • CHICAGO, 6525 W. ROOSEVELT RD. • CINCINNATI, 2253 FREDONIA AVE. • CLEVELAND, 13235 LAKEWOOD HEIGHTS BLVD. • DENVER, 4501 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1930 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, 1723 HENRY W. OLIVER BLDG. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.

Another Goodyear First!

WIDE-BASE
earth-mover tires on the newest, most modern equipment!

NEW
Wide-Base
SURE-GRIP LUG



NEW
Wide-Base
HARD ROCK LUG

WIDE-BASE SURE-GRIP LUG mounted on new mammoth scraper

FIRST to fill the need for better flotation on *all* wheels! Goodyear's new *wide-base* earth-mover tires have larger air chambers –so can operate at lower inflations for same loads. The treads lie flatter on the ground, they cover more ground – you get better flotation and better traction.

Pioneered by Goodyear, two years ago, *wide-base* earth-mover tires are now original equipment on some of the foremost makes of earth-moving vehicles. Specify them on new equipment – and get more work done for your dollar! Goodyear, Truck Tire Dept., Akron 16, Ohio.

BUY and SPECIFY

Made with Goodyear's exclusive
3-T NYLON CORD
for the greatest stamina ever built into an earth-mover tire!

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TIRES THAN ON ANY OTHER KIND

Sure-Grip–T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

When you're CORE-DRILLING, it's no gamble with these 3 aces in the hole

22-HD The rugged, heavy-duty model. Capacity—2000' with EX fittings. Also available as truck-mounted drill or on twin-column mount for underground operation. Bulletin D-28.

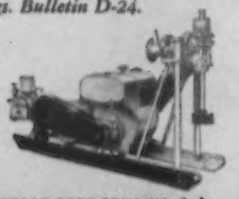
1

12-B Extremely portable, weighs approximately 1200 lbs. Capacity—1000' with EX fittings. Also available on twin-column mount with air motor drive for underground operation. Bulletin D-21.

2

No. 7 The lightweight, easily transportable model. Can be taken underground or transported by airplane, boat, or even muleback into remote areas. Capacity—500' with EX fittings. Bulletin D-24.

3



CONTRACT CORE DRILLING *Sub-surface test borings for mineral prospecting, foundation drilling, and grout hole drilling are available on a contract basis. Highly skilled crews and complete stock of core drills, bits, and accessory equipment are maintained at all times.*

JOY Diamond Core Drills When these three "aces" go into the holes, luck no longer is a factor. They are a sure bet to tell you exactly what is down there. And, at Joy, you can find the right "ace" to do the best job for you.

With maximum capacities ranging from 500 to 2000 feet, there are Joy diamond drills applicable to almost any coring job. And they'll do the best job for you. Here's why . . .

EXTREME PORTABILITY Skid mountings, compact design, and rugged construction make it possible to drag Joy diamond drills into some of the most inaccessible locations.

VERSATILITY Because they are available with either hydraulic or screw-feed swivelheads and with a choice of gasoline, electric or air power, Joy core drills can fit into any drilling program without expensive preparations.

Check your drilling needs against this group of outstanding drills. One of them will be suitable to your needs and it will do an accurate, economical job of proving the mineral value of your property. Write today for literature on the machine you need to **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

W&D M5508

JOY

WORLD'S LARGEST MANUFACTURER OF CORE DRILLS AND MOTORIZED DRILL RIGS SINCE 1851

3 shovels,

10 trucks,

23 stone stockpiles,

2 waste dumps...

1 tractor handles all cleanup

Too big for shovel to handle, these limestone chunks are dozed into worked-out sections of the pit. Four-wheel drive, 208 hp give tractor plenty of power to push up to 2½ cubic yards (5½ tons) per pass.

Tournatractor can switch up to 10 rail cars at once. Low-pressure tires do no damage to rails, ties, or paved surfaces. Supt. J. M. Christopher reports this unit requires "much less lubrication and considerably less maintenance than crawler-tractors formerly used."

For 100 years, the East St. Louis Stone Company and its predecessors have been quarrying limestone from a pit near Belleville, Illinois. For 100 years, they have dug in different directions, until, today, load areas are far apart and on levels varying from near-surface to over 225 ft. below surface. Three shovels and ten 11-ton trucks are now used to remove about 750,000 tons of stone yearly.

Suppose you were running this big job. Suppose you had to contend with its widely-scattered loading sites, its network of haul roads, and its steep grades. How many tractors would you ask for to do the "housekeeping" chores? How many to handle shovel cleanup? How many for haul road maintenance? Dump cleanup? Stockpiling? Emergency work?

East St. Louis Stone Company's Superintendent, J. M. Christopher, has what you'll probably agree is the most efficient answer possible. He is using *one tractor to do it all!* His choice is a high-speed rubber-tired Tournatractor.

Travels 1670 feet in 1 minute

This mobile unit "runs" from job to job at speeds to 19 mph. It dozes at speeds up to 8 mph. "We sure like its ability to go fast from one place to another," says Mr. Christopher. Its regular assignments, scattered 0.1 to 1.5 miles apart, include:

1. Cleans pit floor around all 3 shovels (1½, 2 and 2½ yds. in size). Works at each shovel two or three times per 8-hour shift. Besides ordinary cleanup, dozes over bank any rock chunks too big for shovel to handle. Typical 150 ft. to 200 ft. one-way push takes one minute . . . backup same distance takes half a minute.
2. Cleans shot stone after blasting at each of the 3 locations.
3. Moves large Joy drill around pit.
4. Levels and cleans around crushed stone stockpiles once or twice a day.
5. Levels waste dump once a day. Material mostly clay mixed with limestone. Tournatractor dozes up to 2½ cubic yards per pass.
6. Blades haul roads for the 10 trucks about once a day.
7. In emergencies, switches railroad cars. Can push 3 full cars (total weight, approximately 240 tons) or 10 empties.

Let us demonstrate

If speed on similar jobs is important to *you*, let us show you the fastest tractor on the market today . . . the 19 mph Tournatractor. We'll be glad to demonstrate on your job, doing the work you're interested in. Call us to arrange time and place.

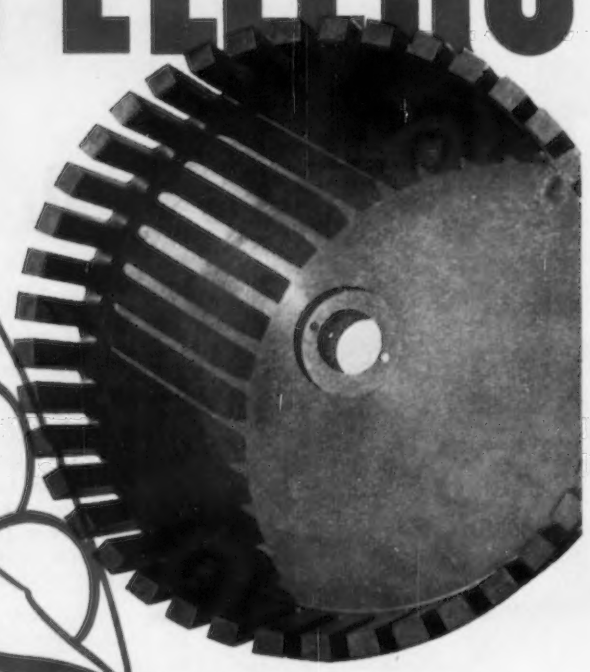
Tournatractor—Trademark Reg. U.S. Pat. Off. T-787-Q-b

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

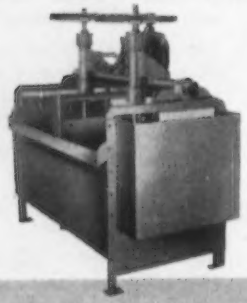
A Subsidiary of Westinghouse Air Brake Company

As like as peas in a pod!
NEW Pressure-Molded
(RUBBER COVERED) IMPELLERS



The rubber covering of the metal core of the AGITAIR® impeller is now molded in a single power pressure operation. The result is a new degree of uniformity never before achieved and a speed-up in production that enables us to meet the ever-increasing demand for the world-famed . . .

AGITAIR® FLOTATION MACHINE



The marked improvement in the impeller—heart of AGITAIR® —results in a greater uniformity of operation and insures longer life before repairs or replacements are required.

Keep your metallurgy up to date by installing AGITAIR® —the machine that is progressively improved by laboratory experiment and mill experience. Write for details.

Other Galigher Products

Commercial and Laboratory AGITAIR®
Acid-proof Sump Pumps
Laboratory Ball Mills
Geary-Jennings Sampler
Geary Reagent Feeder
Laboratory Pressure Filters

Leaders in Experience & Service

THE GALIGHER CO.

METALLURGICAL DIVISION — ENGINEERING SERVICE

CONSULTATION • ORE TESTING
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Home Office: P. O. Box 209 Salt Lake City 10, Utah
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How New Mexico copper mine speeds tractor work

One Tournatractor clears rock from highway.

The other cleans pit floor around shovel.

WITH mostly rock to handle on a 6-day week, year-round basis, a large open-pit copper mine in New Mexico uses 2 Tournatractors as utility tools.

These rubber-tired tractors clean up around large stripping shovels. They also keep haul roads and highways clear of rock, traveling over pavement without damage. When mixed dirt and rock are encountered, one unit pulls a 20-yard scraper; the other, a Rooter. In spare time, Tournatractors do a wide variety of odd jobs, including stockpiling, unloading supplies, pushing railroad cars, etc.

Their chief advantage for this scattered work is their speed. They can go anywhere — across the pit floor or over pavement — at speeds up to 19 mph. With instant-shift transmission and 8 mph reverse, they work 2 to 3 times faster than crawlers on most pushing and pulling jobs.

See for yourself

We will be glad to demonstrate a Tournapull or Tournatractor in your pit. They're better tools than ever since Westinghouse Air Brake's quality manufacturing tradition has been added to LeTourneau's earthmoving leadership.

Tournatractor — Trademark
Tournapull, Rooter — Trademark Reg. U. S. Pat. Off. T-472-M-b

LeTourneau-WESTINGHOUSE Company

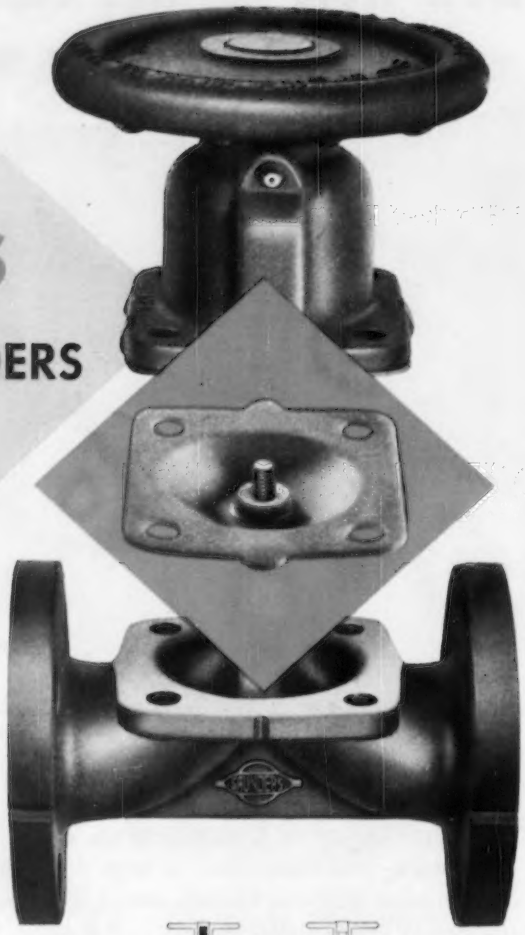
Peoria, Illinois

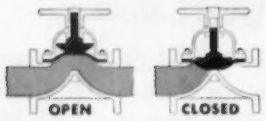
A Subsidiary of Westinghouse Air Brake Company

Unaffected by all chemicals normally found in industry

Teflon Diaphragms

for GRINNELL-SAUNDERS DIAPHRAGM VALVES





Having valve trouble? Are your chemical services so tough that valves disintegrate? Grinnell-Saunders Diaphragm Valves with TEFLON* diaphragms may solve your problems.

Grinnell TEFLON diaphragms are made by a new and unique process which produces a better product of greater density, toughness and flex life. TEFLON offers a high degree of chemical inertness to all chemicals normally found in industry.

Grinnell-Saunders Diaphragm Valves are available with bodies of iron, bronze, stainless steel, cast steel, aluminum, Monel, Saran, Durimet; and with body linings of glass, lead, soft or hard rubber, neoprene, Saran. Diaphragm life depends on temperature, pressure, and frequency of operation. Your inquiries, which should be accompanied by complete service data, will receive prompt attention.

**Registered Trade-Mark, E. I. du Pont de Nemours & Company, for its tetrafluoroethylene resin.*

- Diaphragm lifts full height for streamlined flow in either direction
- Resilient diaphragm assures positive, leak-tight closure even with grit or scale in the line
- Diaphragm absolutely isolates working parts from fluid . . . sticking, clogging, contamination, corrosion eliminated
- Body, lining, and diaphragm materials to suit service
- Simple maintenance. Diaphragm can be replaced easily without removing valve from line. No packing glands to demand attention. No metal-to-metal seats to become damaged or wire-drawn

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

Simple rear-dump construction pays off

Construction of the Tournapull Rear-Dump has been radically simplified from that of a conventional heavy-duty hauler. In place of a foundation frame and body sub-frame, Tournapull Rear-Dump hitches rear and front wheels through a horizontal yoke extending back from the kingpin and pivoted to the body itself just above and ahead of the rear wheels. Body is simpler, much stronger . . . has no frame and sub-frame to get out of line.

Look at the photo above . . . note the absence of springs, spring hangars, and tie rods. Low-pressure tires adequately absorb the shocks of rough haul-road travel and high-speed loading. Eliminated are spring maintenance, replacement time and cost of spring parts.

Front wheel drive and kingpin-type steering help simplify Tournapull construction, too. No longer must power be carried back to the rear through a drive-shaft. Bearing and lubricating problems of a long drive-shaft are eliminated. No longer is steering handled by small front wheels subject to misalignment. There are no tie rods, no hinged steering connections to become twisted or bent.

Nor do you have the troubles of hydraulic hoists or gravity dumping with these Rear-Dumps. Dump is by an electric winch that lifts the body up on twin cables. Operation is under complete control at all times, with positive power for dump and return controlled by an electric switch on the dash. There are no oil seals, no high-pressure lines and jacks to keep tight, no freezing up in cold weather as with hydraulics. There are no shock loads as in gravity dumping. You save on regular maintenance time because there is no hoist mechanism to check . . . only a few places to lubricate.

Let us show you how these savings can put money in *your* pocket. For proof, we'll be glad to show you performance figures from a job like yours, or, if you wish, give you names and addresses of owners of Tournapull Rear-Dumps, so you can check for yourself. Call soon.

Tournapull Rear-Dumps Come in Sizes to Fit Your Needs

"D"	"C"	"B"	"A"
9 tons	22 tons	35 tons	50 tons
138 hp	208 hp	293 hp	420 hp

Prime-movers also power interchangeable scrapers, bottom-dumps, flat-beds, and cranes.

Tournapull—Trademark Reg. U.S. Pat. Off. R-774-G-b

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

HEADPIECE HOUSING

Molded of tough, lightweight plastic. Designed to direct the light to the job.

DOUBLE FILAMENT BULB

Two filaments of equal light output in one bulb. If one filament burns out, second filament restores full light.

ADJUSTABLE CRADLE

Positive screw control moves bulb cradle for accurate spot-beam focusing.

BEZEL RING AND LOCKS

Sturdy bezel makes tight seal, is easily removed. Contains rubber-cushioned lens. Locks prevent tampering.

EXCLUSIVE NICKEL-IRON-ALKALINE CELLS

Battery does not destroy itself to function; does not deteriorate when not in use. Welded steel containers enclose the cells and the entire battery is encased in a high-strength, non-combustible, corrosion and impact resistant molded nylon case. The valve block is one-piece nylon construction, easily removed. All exterior metal parts are stainless steel. Rugged hood contains dependable magnetic lock device.

THE EDISON R-4

. . . is worth looking into

Convincing testimony that QUALITY COUNTS in underground illumination is provided by the world-wide acceptance of the Edison Electric Cap Lamp.

Designed from a thorough knowledge of overall mining problems, the Edison R-4, made up of compact, easily handled sub-assemblies, has the QUALITY features that keep a brilliant, unfailing beam on the job, shift-after-shift, for years.

We'll be glad to show you how this EDISON R-4 QUALITY can put new peaks on your production records, safely.

MSA
SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M.S.A. is at your service. Our job is to help you.

MINE SAFETY APPLIANCES COMPANY
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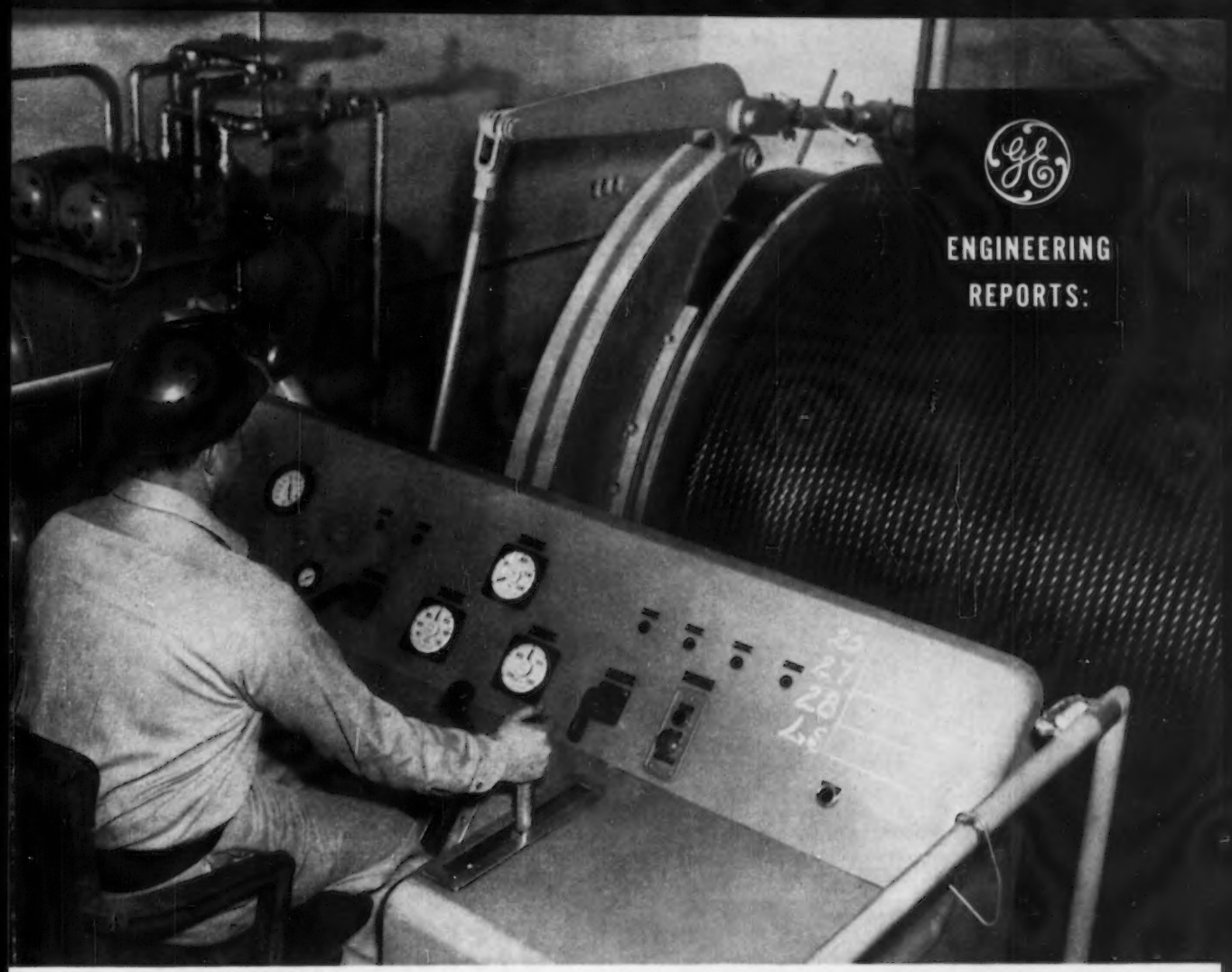
At Your Service:
72 Branch Offices in the United States & Mexico

MINE SAFETY APPLIANCES CO. OF CANADA, LIMITED
Toronto, Montreal, Calgary, Edmonton,
Winnipeg, Vancouver, Sydney, N.S.



CUSTOM-BUILT G-E manual or automatic mine hoist drives are available in many types for heavy-duty hoisting.

G-E electrical systems and equipment help you . . .

Mechanize underground mining for more tonnage at lower cost

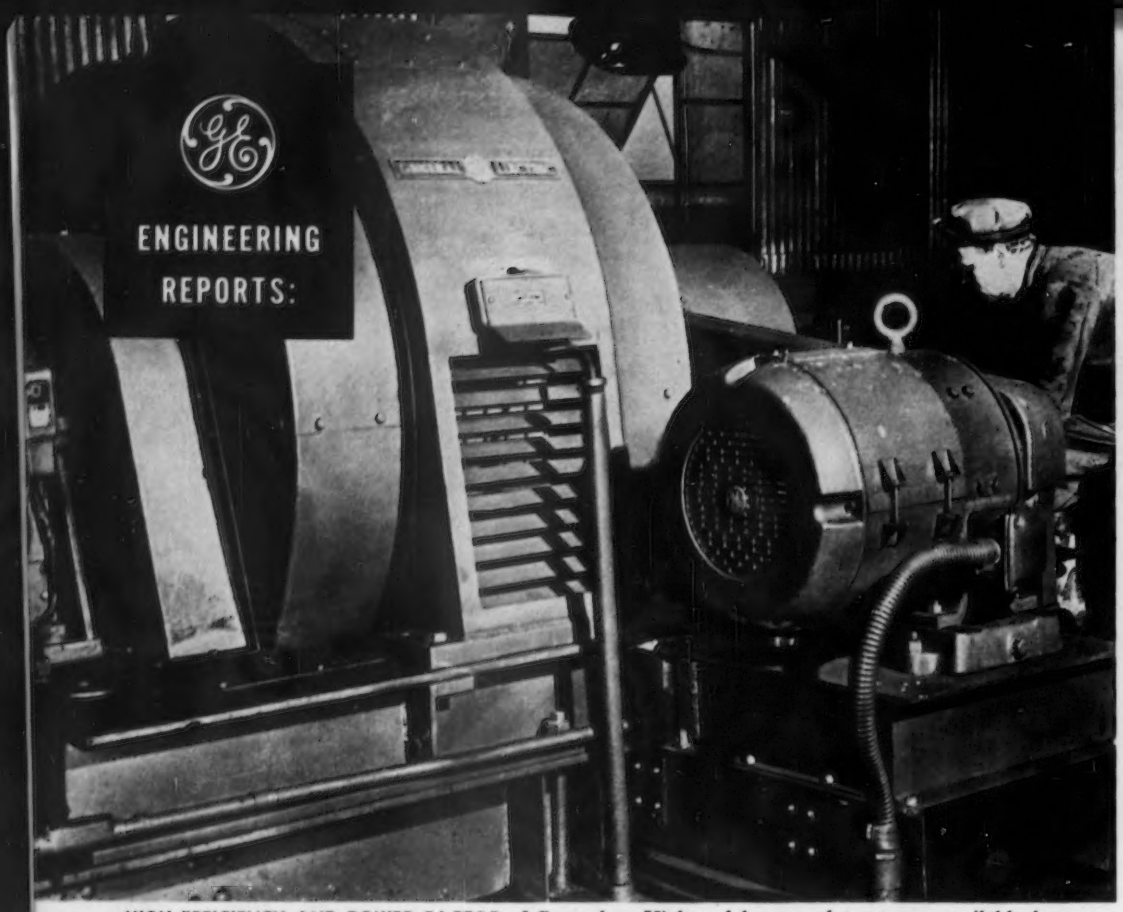
As market conditions change, underground mines must produce more, faster, and more efficiently, to improve their competitive position. Key to this objective is increased mechanization, with General Electric's help.

You benefit many ways when you specify G-E electrical systems and equipment. Advantages like these can play an important part in your mine mechanization program:

- **FACTORY-ASSEMBLED** G-E power-system equipment cuts installation time and cost, speeds new construction and start-up.
- **SPACE-SAVING** G-E electrical equipment adapts readily into existing systems, can be expanded easily, at low cost.
- **LOW-MAINTENANCE** G-E drives are designed to last longer, provide more horsepower in limited space, with maximum accessibility for servicing.

TURN PAGE FOR MORE PRODUCT INFORMATION

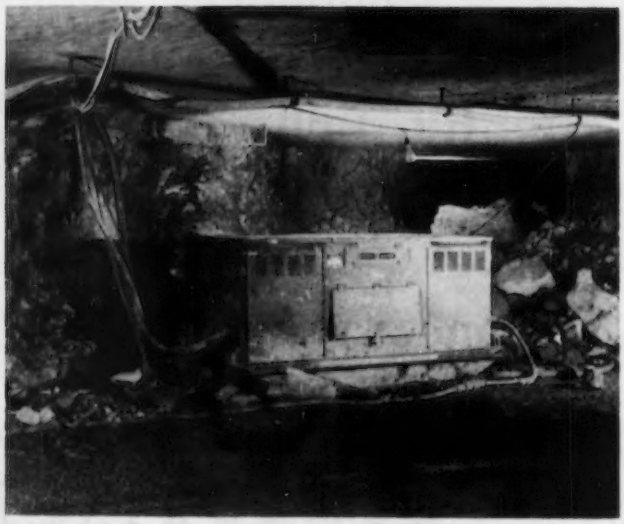
GENERAL ELECTRIC



HIGH EFFICIENCY AND POWER FACTOR of General Electric synchronous conveyor or compressor motors cut electrical losses, and can reduce power rate. High and low speed types are available in many sizes, with just the required type starting, pull-in, and pull-out torque.

System-engineered raises efficiency of

CONTINUITY OF PRODUCTION and flexibility of operation are promoted by G-E metal-clad switchgear. Factory-assembled, it is easily installed and maintained.



MORE DEPENDABLE G-E a-c mine power supply, used underground, steps down voltage close to the mining load, minimizing voltage drop, increases the efficiency of your mining machines.

LOW COST CONVERSION of power is obtained with portable G-E mining-type mercury-arc rectifiers. Move easily as face advances. Absence of major rotating parts reduces wear, shutdowns.

SPECIALLY DESIGNED for service reliability, rugged G-E totally enclosed fan-cooled Tri-Clad* motors are also available in design approved by Bureau of Mines.

G-E equipment underground mining

Modern General Electric equipment can give you the speed, flexibility and safety you need for more efficient underground mining. G.E. can also help in these ways:

Latest electrical techniques are employed by G-E application engineers, working closely with you or your consultants, to give you the most flexible and lowest-cost system for your mining needs.

Extensive developmental facilities are constantly used by G-E product engineers in providing new and improved products to help you increase mining output and efficiency.

From early plans through start-up, G.E. can co-ordinate selection, delivery and installation of all your electric equipment, saving you engineering time and construction costs. For more information, contact your nearest G-E Apparatus Sales office, or write General Electric Co., Schenectady 5, N. Y. 660-33

HIGH AVAILABILITY of G-E mine locomotives cuts costs. G.E. offers a variety of types which handle easily, efficiently, and help speed all haulage in underground mines.

*Reg. trade-mark of General Electric Co.

Engineered Electrical Systems for Underground Mining

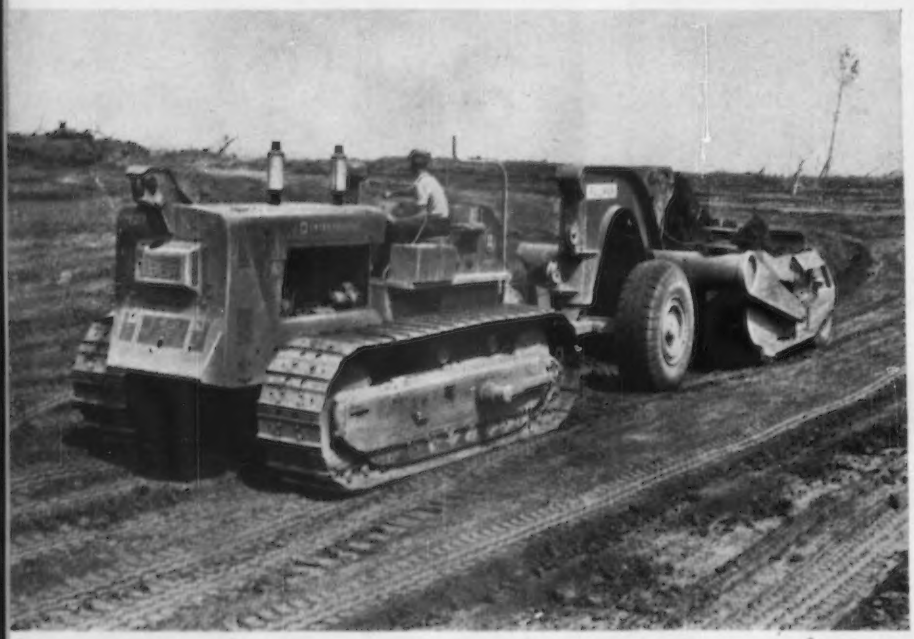
GENERAL ELECTRIC

A PICTURE REPORT OF

INTERNATIONAL POWER *in action!*

Boosting job production everywhere

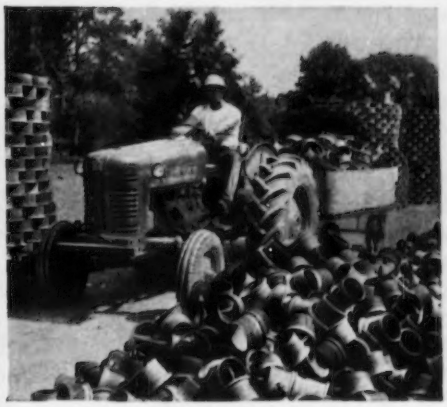
"1/3 more overburden daily than competitive crawlers" . . . that's the report from Merkli Brothers Coal Company, Beaver, West Virginia, on their TD-24. Unit is stripping 40 ft. of sandstone and shale to uncover a 12 to 51-inch coal seam. "It has better balance and visibility than other tractors," says Partner Henry L. Merkli. "It costs less to maintain; takes less time to grease, too."



Strips for barite ore—Near Cartersville, Georgia, Paga Mining Company's two TD-24's average a 4,000 ft. stripping cycle every 10 minutes. This includes time to self-load 15 cu. yds. Units are removing 50 ft. of overburden to reach a 15 ft. seam of 9 to 30% barite. They move 2,000 to 2,500 cu. yds. of spoil per 10-hour day. The plant produces 400 tons of barite in the same time, for use in chemical, paint, and oil industries.

Crushes gypsum—Near Avenal, Calif. Superior Gypsum Company's International-powered crusher produces 300 tons of gypsum per 8-hr. day. Material is used to neutralize high-alkali irrigation water.

1 more trip hourly—Fast loading and acceleration help 18½-yd. Payscraper make one more trip hourly than other self-propelled scrapers used by W. E. O'Neill Construction Company, Gary, Indiana. Cycle length averaged 2½ miles; material was mostly sand. For hauling ore, scraper interchanges with bottom-dump wagons.



Tows 1500-lb. loads and often 4500 lbs. Utility of IH wheel tractors is now unsurpassed. This unit tows castings for a plant near Longview, Texas . . . others do loader, fork-lift, similar tasks.

No repairs in 2 years of continuous crusher service—that's the record of the International 125 hp diesel shown above. Average output, in gravel pit near Bartlett, N. H., is 100 cu. yds. hourly.

Rugged in rugged rock—"TD-6 is ideal for opening underground mines," says M. McDonald, Kiabob Uranium Corp, Green River, Utah. "It gets around fast in narrow tunnels, yet brings out BIG loads."

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WHEEL TRACTORS

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ALSO: International Draft Loaders . . . International Scrapers, Bottom-Dump Wagons . . . and International Superior Pipe-Boom Tractors.

Now! 300% more hole at 60% less cost...

with Crucible CA DOUBLE DIAMOND alloy hollow drill rods

That's the phenomenal results construction men are getting with Crucible's new CA DOUBLE DIAMOND alloy hollow drill rods.

These new rods actually have *three times* the drilling life of ordinary carbon rods. On one major construction job CA DOUBLE DIAMOND alloy rods averaged *630 feet per rod*. And, although they are slightly higher in price, these longer-lasting rods cut costs by 60%.

It's the *steel* that makes the difference. For CA DOUBLE DIAMOND is a tough, high-carbon, high-chromium *alloy* steel, *prescription-made* for maximum resistance to wear and abrasion. What's more, its hardness in the natural or as-rolled condition is substantially higher than carbon rods. You get a stronger rod with higher fatigue resistance.

With CA DOUBLE DIAMOND, as with any alloy steel, special heat treating methods give the best results. And they'll pay off in longer rod life . . . lower drilling costs. Crucible will be glad to supply full information on CA DOUBLE DIAMOND alloy rods . . . or on its many other alloy steels for construction applications. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Off-Road Transporters

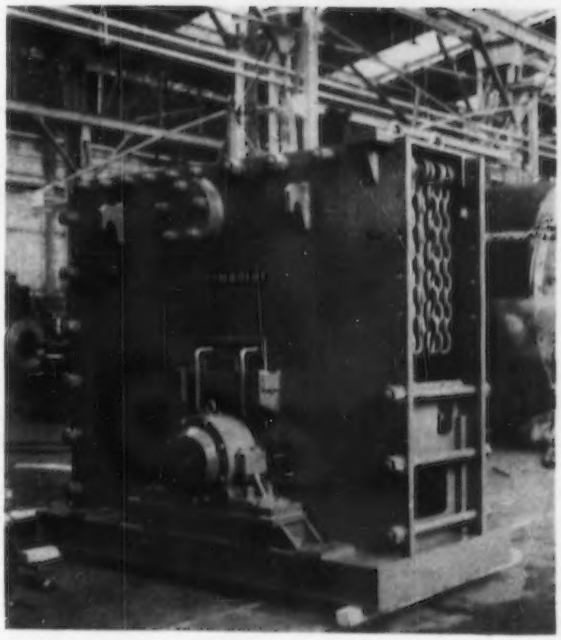
GIANT CROSS-COUNTRY FREIGHT TRAINS, now being made by R. G. LeTourneau Inc., Longview, Tex., promise to open new horizons for world commerce. Each huge wheel is driven by an electric motor tucked into its center. Unique steering arrangement assures that last car of freighter will follow identical tracks of first car, regardless of number of cars in between. Tremendous power available is reported to enable trains to climb grades of 20% or more, and move cargo at sufficient speed over open country or bulldozed trails to make overland hauling profitable.

The Cross-Country Freighters, distribute total motive power under total load. One car carries an electric generating plant for a source of power that is convenient and flexible to distribute. The electric motor and gear reduction built within the rim of each wheel uses this energy so that no cargo car is either pushed or pulled, each carries its own load. But because cars are coupled mechanically as well as electrically, the wheels reinforce each other.

Huge tubeless, low pressure tires, up to 10 ft in diameter, absorb shock and permit firm attachment to heavy steel mountings. Oscillating axles further reduce shock.

Each car automatically steers the one immediately behind it through the mechanical coupling. Operator steers two front wheels of train by electric controls. **(1)**

Impact Crusher



BUILT OF SIMPLE DESIGN ELEMENTS, Empra-type 50-B single rotor impact breaker made by Klockner-Humboldt-Deutz AG, Koln, Germany, is said to be designed for severest working conditions with minimum attendance and maintenance.

Features noted by the company are: easily replaced beater, impact and grate bars; absence of any foundation requirements; quick, easy assembly or disassembly; and outstanding adaptability to different crushing problems. It is claimed to be long lasting, sturdy and reliable.

Depending on the individual crushing problem, the heavy steel rotor is equipped with 3 or more manganese steel beater bars, keyed to the rotor by a quick-action locking device and shaped to give best conditions of wear. As a result, bars can be worn down to less than one-third of original weight. Side door in crusher casing allows easy replacement. Rotor shaft runs in antifriction bearings, split castings of which are fastened to separate base frame. At points of heavy wear, special wear plates protect crusher housing which is built up of steel plate. Suspended underneath top plate are flat impact bars and a pedulum-like swing assembly which bears cylindrical impact and grate bars. Swing protects against tramp iron, etc. Weight of swing assembly is adapted to conditions and handwheel adjusts normal gap. Intake sizes go to 59x59 in. **(2)**

Rotary Drill (33)

Requiring no water and easily carried by two men, this rotary drill can probe 100 ft. It has been developed by American Percussion Tool Co., Simi, Calif. and cuts a 1¾-in. hole with ¾-in. core. Cuttings are exhausted by vacuum air pump incorporated into unit which is powered by a 9-hp McCulloch gasoline engine. Set-up takes 10 minutes. American Exploration Co., Simi, is sales agent.

Dust Collector (34)

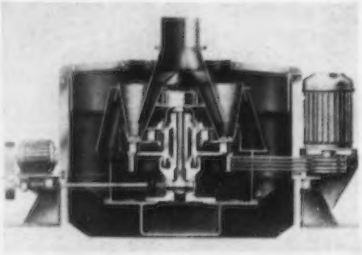
Six "throw away" filter pads is one feature of the after-filtering mechanism on Model 219 FM-A cyclone-type dust collector made by Torit Mfg. Co., St. Paul, Minn. Used in industrial plants, filtered air is recirculated back into room to prevent heat loss. The unit's 5-hp motor pulls in 2,100 cu ft of air per minute at 3-in. water gage. Filter pads are made of glass wool.

Stud Driver (35)

Interchangeable ¼- or ⅜-in. barrels on Model 455 stud driver of Remington Arms Co., Inc., Bridgeport, Conn., permit use of different "power loads" for better match of specialized studs with other variables. Older model used only one charge.

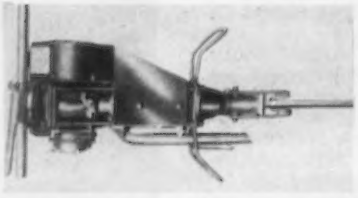
Tubeless Tires (36)

Earth mover tires, first and largest tubeless, are now in production at Goodyear Tire & Rubber Co., Akron, Ohio. Known as Wide Base Earth Movers, the same as Goodyear's older, standard type, these new tubeless tires come in sizes up to 37.5-33. Mounting of these huge tires is simplified with Goodyear's multiple-piece rims, especially designed for tubeless application. First job application was to 41 cu yd heaped Wooldridge scrapers used on highway project in Ohio by contractor C. F. Replogle.



Centrifugal Dewaterer (37)

Axial vibration is added to rotation of screen drum in this continuous discharge centrifugal dewaterer. According to Klockner-Humboldt-Deutz AG, Koln, Germany, this gives a suspension effect cutting interparticle and screen friction. This, in turn, eliminates any mechanical discharge device and avoids undesirable reduction in grain size.

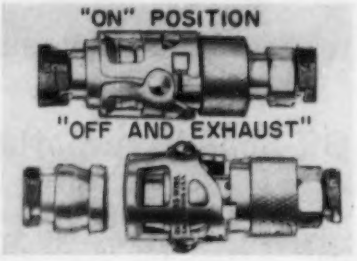


Gasoline Rock Drill (38)

Syntron Co., Homer City, Pa., has an improved self-contained gasoline powered rock drill, the RD-55. It can drill to depths of 13 ft. Cuttings are blown out with air compressed by reciprocating hammer. It has automatic rotation.

Wheeled Tractor Shovel (39)

World's most powerful rubber-tired tractor shovel is the claim for Michigan Model 175A with turbocharged diesel engine rated at 165 hp. Clark Equipment Co., Benton Harbor, Mich., is maker of the 2¼-yd shovel which has four-wheel drive and rear wheel steering. Ample power at high altitudes is one advantage of the turbocharged model, says the company.

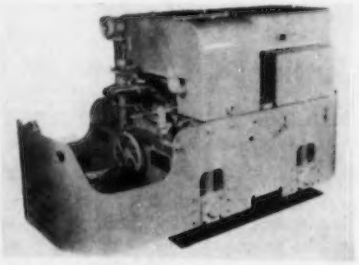


Valve Couplings (40)

Designed to permit line air to be shut off and tools changed easily, quickly and safely at any point, Quick-As-Wink couplings are offered by C. B. Hunt & Son Inc., Salem, Ohio. Jaws on valve half clamp over shoulder on connection half. Sleeve, moved forward, opens valve. Moved to rear it shuts off air and exhausts tool. Sizes are from ¼- to ¾-in.

Level Controller (41)

Electronic and pneumatic controls are combined in "Pneutronic" level control by Robertshaw-Fulton Controls Co., Philadelphia, Pa., High speed response and modulating action are believed advantageous in controlling level and flow in many operations.



Diesel Locomotive (42)

Small but mighty is the description given by Goodman Mfg. Co., Chicago, Ill., for their Mancha 2-ton diesel locomotive. Designed along same principles as their "Little Trammer" battery type, it is claimed to be an ideal work horse for continuous service where 1,000-lb drawbar pull is enough. It has a torque converter and exhaust scrubber.

Stench Warning (43)

Self-injecting into 100 psi air lines, packaged stench warning system from Reed Engineering, Los Angeles, Calif., uses a small steel pressure cylinder containing ethyl mercaptan, inert gas propellant and flame quencher.

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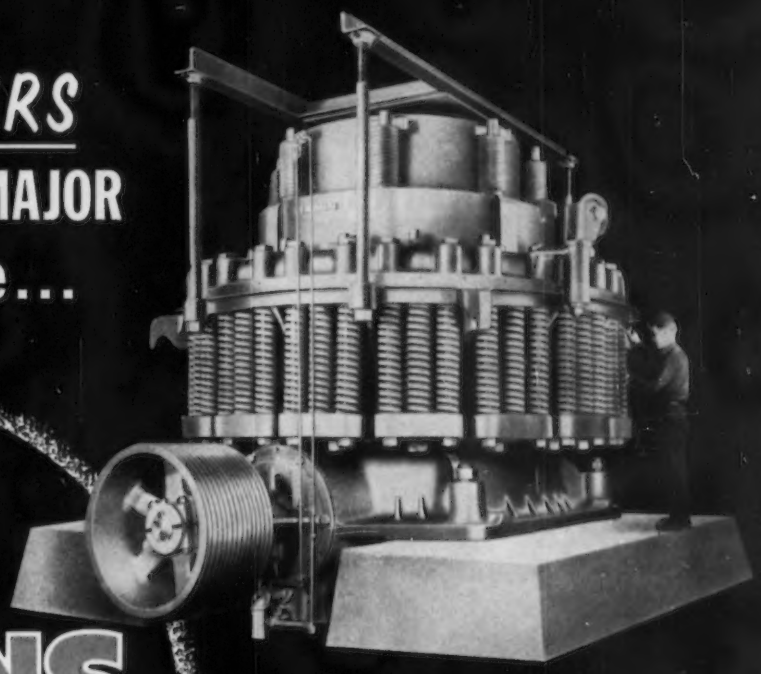
from the WORLD'S MAJOR PRODUCERS prove...



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- ✓ MAXIMUM LINER UTILIZATION
- ✓ GREAT CAPACITY OF FINELY AND UNIFORMLY CRUSHED PRODUCT
- ✓ LOW COST—TROUBLE-FREE OPERATION

Symons Cone Crushers, *the machines that revolutionized crushing practice*, are built in Standard, Short Head and Intermediate types, with crushing heads from 22 inches to 7 feet in diameter—in capacities from 6 to 900 tons per hour.

Proved in the profitable reduction of these and many more ores and minerals . . .

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• GOLD	• TITANIUM
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MINE HOISTS

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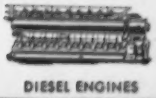
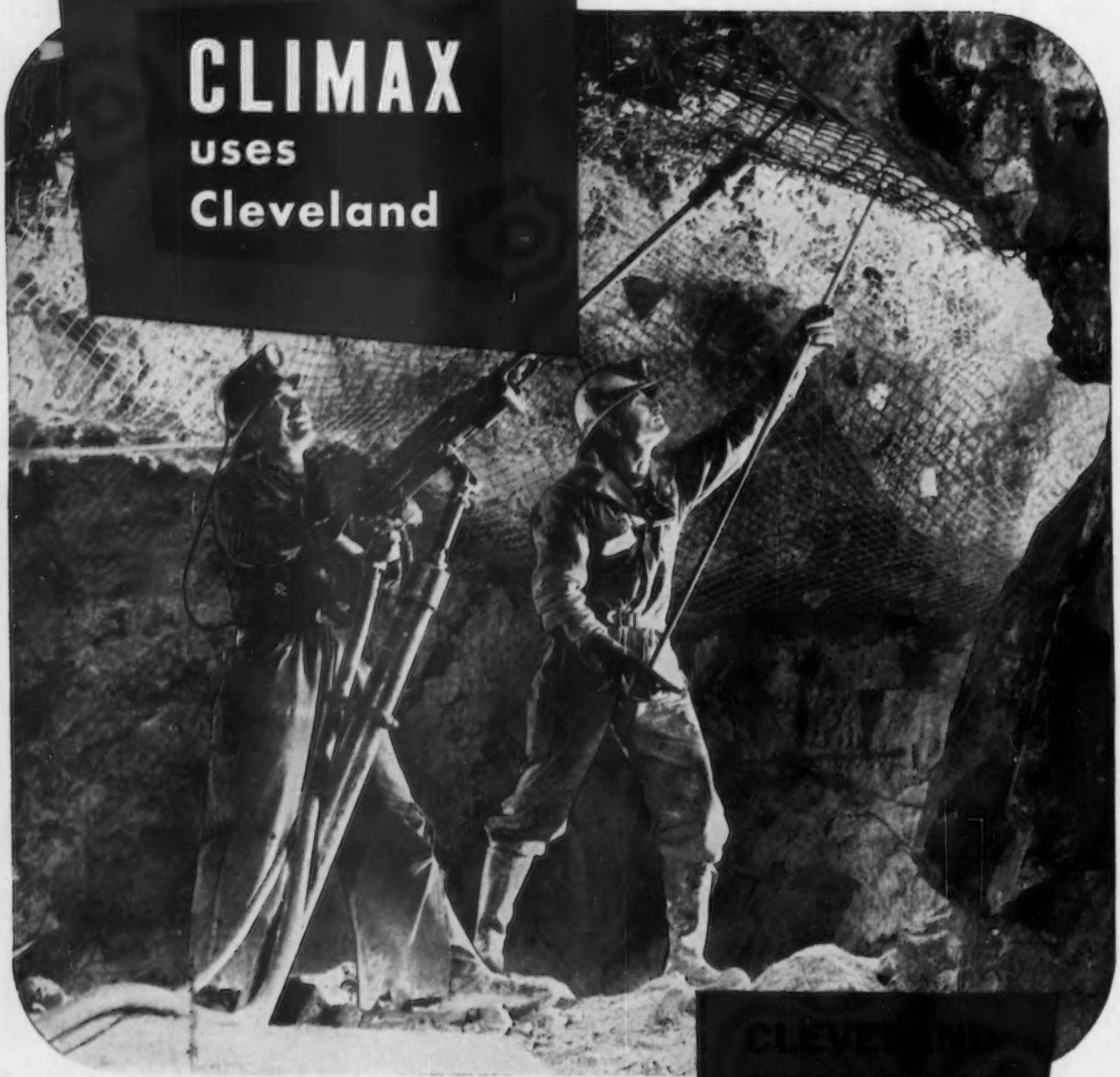


DIESEL ENGINES

C355

© 1955 Nordberg Mfg. Co.

CLIMAX uses Cleveland



H10AL Drills with AL92 Telescopic Air Legs for slusher drift development. These drill combinations not only drill the 8′ blast round but also the 7′ roof bolt holes. In addition they are also used to tighten the roof bolts and expansion shells to tension resistance in excess of 12 tons. These results are obtained through CLEVELAND superiority in drilling speed, handling and exceptional rotation.

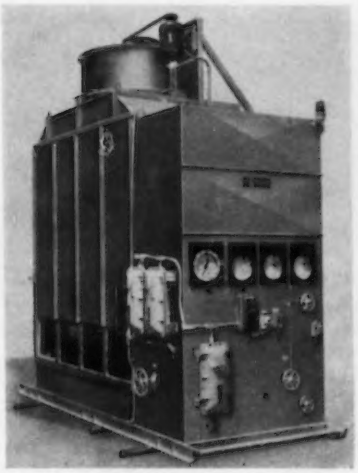
You may test the superior qualities of any CLEVELAND drill in your own mine. Write for Bulletin RD30.

Represented in Colorado, Utah and Wyoming by: Denver Machine Shop, 1409 Blake St., Denver, Colorado and S & M Supply Company, 735 4th Ave., Grand Junction, Colorado.

CLEVELAND ROCK DRILL DIVISION

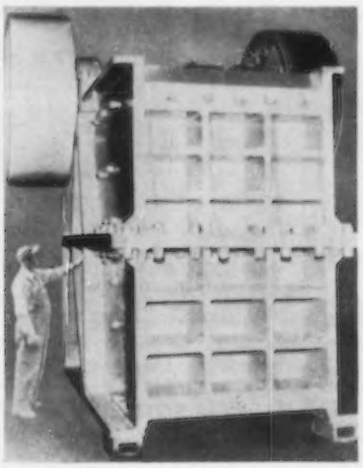
Westinghouse Air Brake Company

RD-71



Ammonia Converter (44)

J. C. Carlile Corp., Denver, Colo., have developed and are producing a line of portable ammonia converters for production of aqueous ammonia. This one, the largest, is for Cuban nickel mine.



Jaw Crusher (45)

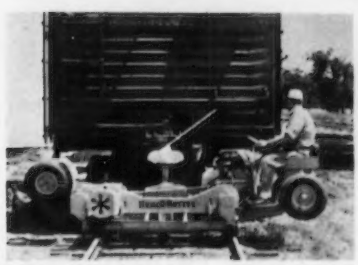
Denver Equipment Co., Denver, Colo., makes the 36x48-in. Type "J" jaw crusher, sectionalized for easy handling, particularly for primary crushing underground to cut drilling and blasting costs.

Chain Hoists (46)

Two light, compact but powerful coil chain ratchet lever hoists have been added to the Super Power line, says Coffing Hoist Div., Duff-Norton Co., Danville, Ill. Models L-1½ and LD-3 are 1½- and 3-ton capacity, respectively. Older models were 2½- and 5-tons. Latter weighs only 56 lb; smallest, only 20 lb when in aluminum fabrication.

Lift Trucks (47)

Torque Converter transmission giving smoother, faster, easier operation has been especially designed for their new KGA 51 line of lift trucks, according to Yale & Towne Manufacturing Co., Philadelphia, Pa. Capacities range from 3,000 to 8,000 lb. They are powered with gasoline, diesel or LP-gas engines. Operator efficiency is emphasized.



Rail Car Mover (48)

HemcO-Motive is a roadable-type rail car switcher which uses the car's weight to gain traction on the rail. Fluid drive saves shock and makes starting heavy loads simple, says the maker. The device develops 7,400-lb draw bar pull and is equipped with a positive coupler for connecting from either side. HemcO Mfg. Inc., Argonia, Kansas, makes it.

Flowmeter (49)

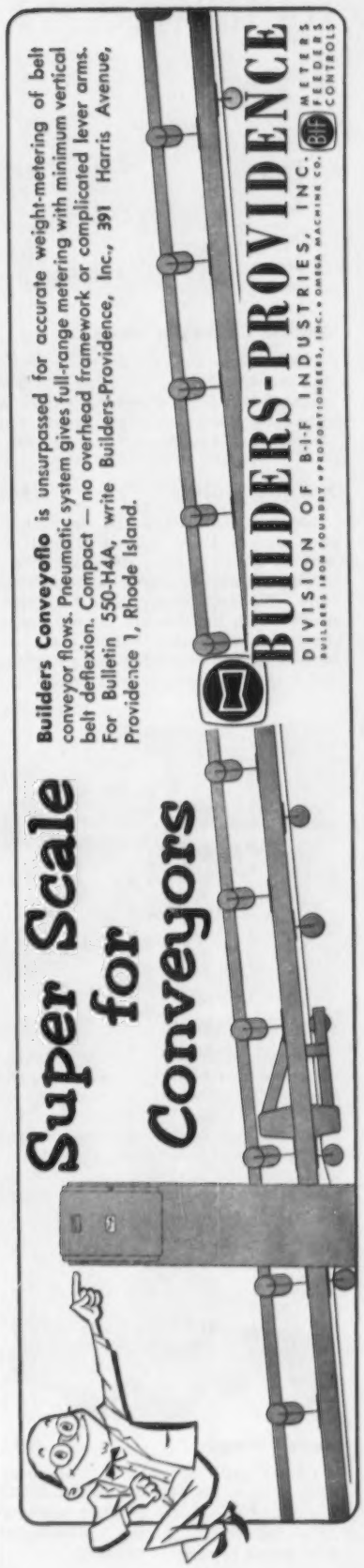
Ultrasonic flowmeter is reputed to be first to successfully use ultrasonic energy to measure volumetric and mass flow rates. It may be used with any fluid regardless of its electrical conductivity and is unaffected by practically all other variables, according to Fischer & Porter Co., Hatboro, Pa. Virtually zero pressure drop is claimed.

Pipe Ball Joints (50)

Barco Mfg. Co., Barrington, Ill., is offering a newly designed ball joint for 8-, 10- and 12-in. piping. They are said to be lighter, stronger and to cost less than previous designs.

Metallograph (51)

All known methods of investigations are claimed possible with the metallograph made by Reichert Optical Works, Vienna, Austria, available from Wm. J. Hacker & Co., New York, N. Y.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Builders Conveyoflo is unsurpassed for accurate weight-metering of belt conveyor flows. Pneumatic system gives full-range metering with minimum vertical belt deflexion. Compact — no overhead framework or complicated lever arms. For Bulletin 550-H4A, write Builders-Providence, Inc., 391 Harris Avenue, Providence 1, Rhode Island.
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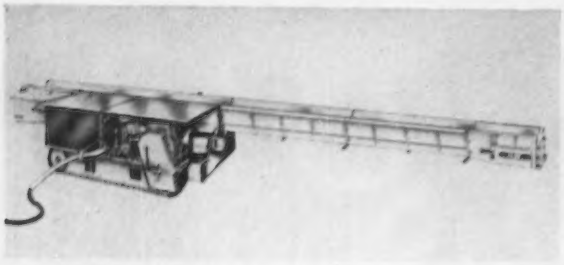


Mobile Conveyor Head (52)

This mobile conveyor drive can save up to 60% of time for pan conveyor moves, says Long Co., Oak Hill, W. Va. Crawler mounted unit is self-tramming through use of hydraulic system driven by electric conveyor motor. Pans and chain are first disconnected. Lengths of 500 ft are said to be practical.

Rope Supported Conveyor (53)

Chain linked idler rolls are suspended between taut parallel wire ropes on belt conveyor introduced by Goodman Mfg. Co., Chicago, Ill. Radical departure from conventional rigid frame and idlers is claimed to reduce shock and increase life of all parts. Maker also says installation is simplified.

Brazing Process (54)

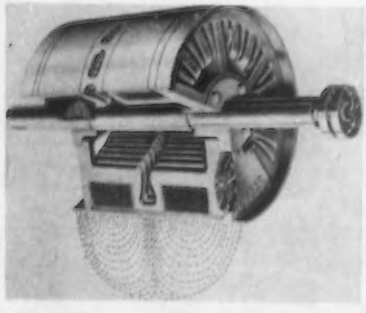
Assembly and prototype fabrication costs are said to be reduced as much as 80% by a high-temperature, copper-alloy brazing process developed by Superweld Corp., N. Hollywood, Calif. It permanently bonds together any ferrous metal parts in a controlled, non-oxidizing atmosphere. Superwelded parts are clean and bright and may be heat treated.

Pump Lubricant (55)

Corrosion and sticking of occasionally-operated pumps is eliminated with Pump-Aid, says Garman Co. Inc., St. Louis, Mo. Compound, supplied in aerosol can, is injected through drain hole and need not be drained before restarting. It is said to help preserve neoprene, rubber and graphite seals and will not freeze or evaporate. Foam fills housing.

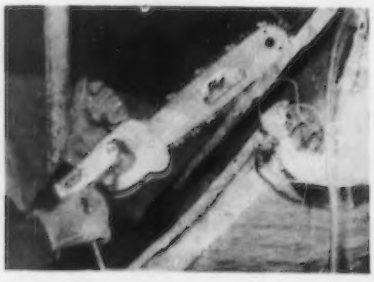
Hardfacing Powder (56)

Wall Colmonoy Corp., Detroit, Mich., says Sprayweld hardfacing applications are improved with a series of nickel-base alloy powders now available. They state Spraywelding, inherently faster than rod methods, is even more quickly done and that deposit efficiency is increased up to 10%, giving same thickness from less powder, by its use.



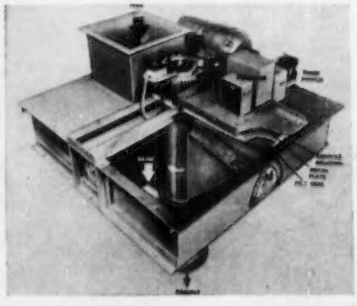
Magnetic Pulley (57)

Stearns Magnetic Inc., Milwaukee, Wis., has announced a two-coil electromagnetic pulley which they say removes more tramp iron than larger units on many conveyor operations. The flux pattern is claimed to conform to conveyor load conditions by giving a deeper magnetic field at center of pulley; thus reducing size of pulley required.



Air Chain Saw (58)

Light-weight, built for quality and low-price are some of the characteristics claimed for Model 2P18, pneumatic chain saw, by Mall Tool Co., Chicago, Ill. One unique quality mentioned is its use for "plunge cutting"—plunging round nose of cutting bar into timber and then working cut larger—which is useful in close quarters.



Dry Sampler (59)

Denver Equipment Co., Denver, Colo., has just completed developing an automatic (Vezin type) dry sampler which, it is said, promises to answer the dust problem in many dry operations. All material in the system passes through enclosed ducts. A feature of the unit is the solenoid-controlled cover preventing continuous sampling.

Motor Wagon (61)

Hydraulically operated bottom dump motor wagon, TW 360, has been added to line of earth moving equipment made by Allis-Chalmers Mfg. Co., Milwaukee, Wis. Struck capacity is 17 cu ft.

Magnetic Drive (60)

"Ampli-Speed" is an adjustable speed magnetic drive available from Electric Machinery Mfg. Co., Minneapolis, Minn. It is designed for general purpose use in plants and mills.

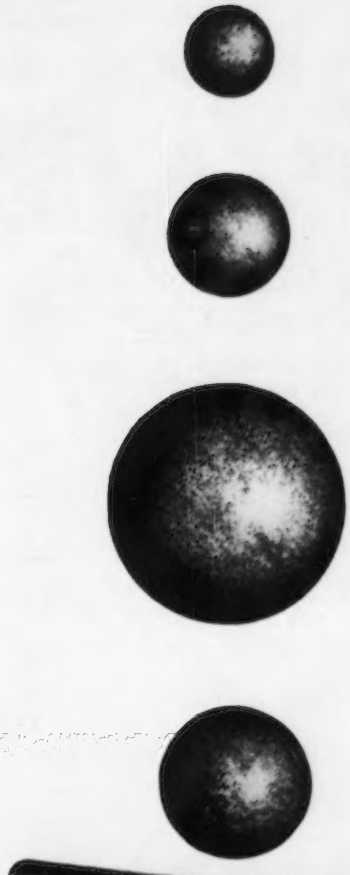
Circuit Interrupter (62)

"Magna-Trip" gives mine trailing cables protection from short circuits yet eliminates false tripping on heavy motor overloads. It is made by Ohio Brass Co., Mansfield, Ohio.

Arm Protector (63)

Wire mesh gives good ventilation for cooler wear with light-weight arm protector from Wheeler Protective Apparel Inc., Chicago, Ill. It lays flat in storage and is adjustable for fit.

IN GRINDING MATERIALS



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. . . AND HERE'S WHY: All grinding balls look alike, and cost pretty much the same. This holds true for grinding rods, too. This being the case, the best way to buy is on the reputation of the manufacturer and the performance record of his products.

CF&I, for example, has an established reputation as a leading manufacturer of quality products for use in the mining industry. Having grown up in close geographical proximity to the western mining industry, CF&I has gained unmatched "know-how" in the production of grinding materials. It is this "know-how," applied at every point in the manufacturing process from ore to finished product, that assures you of getting the best when you specify CF&I Grinding Balls or Rods . . . whatever your grinding application.

As for product performance, CF&I Grinding Balls, forged from special analysis steel, have an ideal balance between toughness and hardness . . . are well known for their optimum grinding ability and wearability. And CF&I Grinding Rods, also made from special analysis steel, machine straightened, and with square-cut ends, have an established reputation for efficiency and economy in grinding operations.

Whatever your grinding material needs, it will pay you to consider CF&I Grinding Balls and Grinding Rods. Contact your CF&I representative to discuss your requirements.

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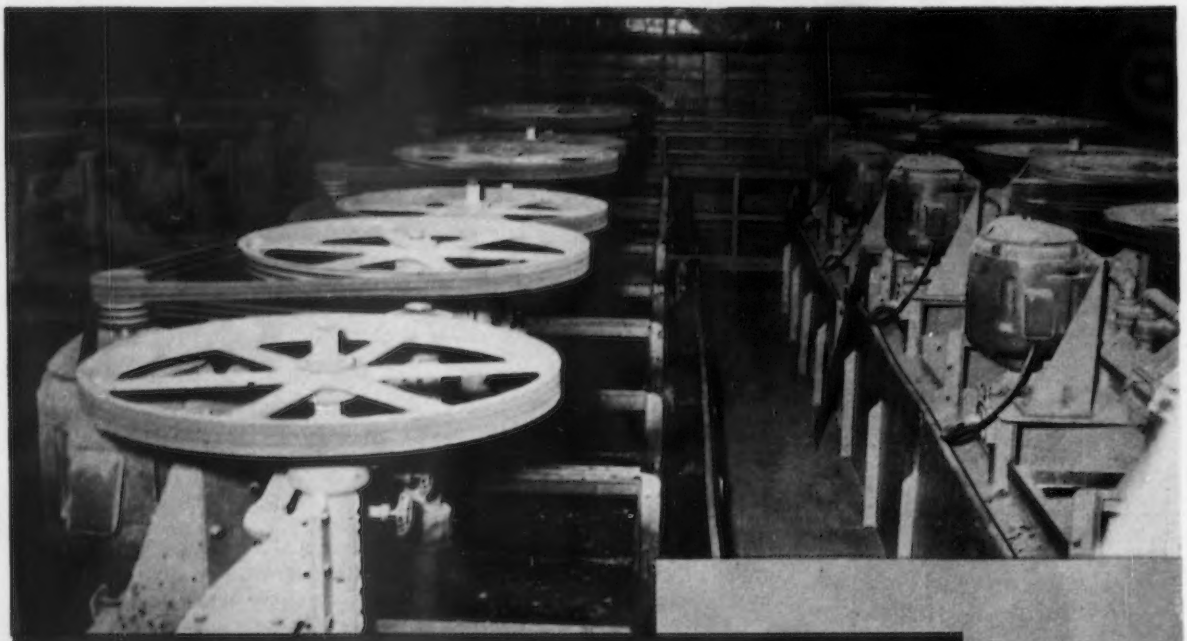

Agitator cells keep high flow rate with Simplex-ANHYDREX Cable

Here, if ever, is the place where cable dependability is of the utmost importance. If the motors slow down or stop because of mechanical or chemical damage to cable, the smooth flow of material stops, too.

Does it make sense, then, to trust the output of a multimillion-dollar mill to cable on which fifty cents per thousand feet was saved?

Simplex-ANHYDREX Cable operates dependably whether conduits are contaminated with pine oil, concentrating agents or condensate.

The jacket and particularly the insulation of ANHYDREX Cable is unusually resistant to moisture. These are qualities you want in your power cable. To be sure you get them, be sure you get ANHYDREX.

Simplex

ANHYDREX Cables

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

NEW PRODUCTS DIGEST *(Continued)*

Circuit Breaker (64)

The Cordon developed by I-T-E Circuit Breaker Co., Philadelphia, Pa., is said to provide a compact, low cost method for high short circuit current protection, while maintaining all operational advantages of circuit breaker. Fuses are welded to a breaker in a common housing slightly longer than ordinary breaker.

Welded Pipe (65)

Trent Tube Co., East Troy, Wis., has been granted a patent on method for making welded pipe and tubing which is claimed to give a better pipe than any on market today regardless of method of manufacture. Weld bead is eliminated on inside of pipe by inert-gas shielded-arc process which fuses butted edges.

Anti-Freeze Coating (66)

To end winter problem of ore and rock freeze-sticking to surface of truck and railcar boxes, spray surface with Cemkote, says Sta-Vis Oil Co., St. Paul, Minn. Compound is furnished as concentrate which is diluted with fuel oil. Extremely low cost is emphasized by company. Application is easy using arbor spray.

Rubber Tires (67)

Steel wire is used to reinforce a new line of automobile and truck tires made by United States Rubber Co., New York, N. Y. The wire is used in addition to textiles and makes tread rupture proof and increases tread mileage according to the announcement. Criss-cross strands in tread give mesh effect.

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

CONVEYOR BELTING selection and maintenance is subject of wall chart offered by Hewitt-Robins Inc., Stamford, Conn. Twelve tips for getting more life out of belts are given along with recommended uses for various types. **(68)**

INSTRUMENTATION LITERATURE available from Minneapolis-Honeywell Regulator Co., Philadelphia, Pa., is indexed in a new bulletin It lists publications and articles according to general subject, product and industry. **(69)**

METALLURGICAL LITERATURE and associated material published by International Nickel Co., Inc., New York, N. Y., are abstracted in several lists offered to those interested. They are designed to help you solve your problems. **(70)**

SILICONE-RUBBER INSULATION for motor and generator stator windings is discussed in a 4-page leaflet released by Allis-Chalmers Mfg. Co., Milwaukee, Wis. It tells why "Silco-Flex" has such superior properties. **(71)**

FILTERS is the title and subject of a 16-page bulletin issued by Denver Equipment Co., Denver, Colo. Disc, drum and laboratory type filters and accessories are covered. Free filtering test service is discussed. **(72)**

PYROMETER SERVICE TIPS are given to users in a new bulletin of Wheelco Instruments Div., Barber-Colman Co., Rockford, Ill. It's a "What to do if — — " type of booklet representing the experience of their service group. **(73)**

FILTERS and their applications are presented in a concise 6-page release prepared by Petersen Filters and Engineering Co., Salt Lake City, Utah. Gives features of three basic types—disc, drum, top feed reservoir. **(74)**

ALUMINUM JOINING is topic of one of a series of folders designed by All-State Welding Alloys Co. Inc., White Plains, N. Y. It covers selection and how to use alloys and fluxes for soldering, brazing and welding. **(75)**

REFRACTORIES, trade marked Firecrete and Blazecrete, are described in a 12-page booklet from Johns-Manville, New York, N. Y. The first is a castable, the second a gunning type. Both are hydraulic settling. **(76)**

LOADING RAMP usage and how to solve specific loading problems with Magcoa Dockboards or Yard Ramps are illustrated and described with thirteen examples given in a folder from Magnesium Co., of America, E. Chicago, Ind. **(77)**

INSTRUMENT & CONTROL LITERATURE published by Leeds & Northrup Co., Philadelphia, Pa., are described in "L&N File Publications" available from the company. Also covered is literature on their heat-treating furnace. **(78)**

DRAG SCRAPERS is one field in which Sauerman Bros. Inc., Bellwood, Ill., has long been active. Cableways is another. Their Sauerman News,

NOV. 1955

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1	15	29	43	57	71	85
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5	19	33	47	61	75	89
6	20	34	48	62	76	90
7	21	35	49	63	77	91
8	22	36	50	64	78	92
9	23	37	51	65	79	93
10	24	38	52	66	80	94
11	25	39	53	67	81	95
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14	28	42	56	70	84	98

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Company .....

Address .....

NEW PRODUCTS DIGEST *(Continued)*

published periodically, contains some meaty case histories. Copies are available. **(79)**

RADIATION PROSPECTING instruments as well as assaying instruments are cataloged in a booklet issued by Victoreen Instrument Co., Cleveland, Ohio. Features of each device, technical data and recommended uses are presented. Accessories are shown. **(80)**

DRILLING SUPPLIES & EQUIPMENT offered by Acker Drill Co. Inc., Scranton, Pa., are described, illustrated and their use explained in a complete up-to-date catalog. Soil sampling toois, diamond and shot core drills, and earth boring tools are covered. **(81)**

LABORATORY EQUIPMENT may be the title of a catalog just issued by Denver Equipment Co., Denver, Colo., but it contains quite a bit more. One part covers minerals and their characteristics, another gives concentration data on them. It's a wealth of knowledge. **(82)**

RADIOCHEMICALS catalog covering the Baker & Adamson brand of General Chemical Div., Allied Chemical & Dye Corp., New York, N. Y., may find a useful place in your library says the company. What they are, how they are used and their costs are also given. **(83)**

V-BELT DRIVE selection as well as other valuable information on principles, design features, and technical data is presented in 74-page handbook on "Texrope" drives made by Allis-Chalmers Mfg. Co., Milwaukee, Wis. It gives operating hints too. **(84)**

BRIDGES, standard highway as well as non-standard types, that U. S. Steel Corp., New York, N. Y., is prepared to fabricate, are cataloged in a new manual. Erection of Adjustable Span type is speeded by rolling pre-assembled structure across gap. **(85)**

SCINTILLATION COUNTER model SC188DA is an airborne-carborne instrument described in brochure issued by Mt. Sopris Instrument Corp., Boulder, Colo. Altitude is synchronously recorded with counter output in airborne application. It has many other advanced features for specialized exploration. **(86)**

HYDRAULIC DRILL BOOMS made by Ingersoll-Rand Co., New York, N. Y. under the trade name "Hydra-Boom" are covered in a new bulletin. Various applications in mining, tunneling and construction are shown. Mountings are especially varied. Drifters and accessories for use with booms are shown. **(87)**

MAGNETIC SEPARATION, principles and equipment, are covered in four of the most attractive booklets we have ever seen prepared by an equipment company. They concern the Humboldt brand by Klockner-Humboldt-Deutz AG, Koln, Germany. Clarity of text is complemented by excellent colored diagrams. **(88)**

HARDSURFACING with tungsten carbide is briefly covered in a folder from Coast Metals Inc., Little Ferry, N. J. It tells what TC is, gives welding recommendations and lists some better known uses. A table presents size and type of welding rod they furnish. **(89)**

TOOLS & EQUIPMENT for maintenance, safety and production made by Martindale Electric Co., Cleveland, Ohio, are shown in their new catalog. A wide variety of products are offered—many that are difficult to find, especially all in one place. **(90)**

SWITCH THROWER made by Cheatham Electric Switching Device Co., Louisville, Ky., is electrically operated by controls mounted on locomotive. It promotes safety and speeds operation according to a new bulletin. **(91)**

VIBRATING SCREEN with electric heating device is described in bulletin from Deister Concentrator Co., Ft. Wayne, Ind. It says Model E Leahy screen is most outstanding fine mesh screen on damp material because of the FlexElex jacket heater. **(92)**

BELT-METER electrical weighing system of Trans-Weigh Co., Wayne, Pa., continuously measures the flow of solids on conveyors. Load cell, recorder and generating tachometer are used. Scheme is described in folder recently issued by the company. **(93)**

STAINLESS STEEL SIDING for building construction made by Joseph T. Ryerson & Son Inc., Chicago, Ill., comes in a mansard pattern. It can be used for single sheet and sandwich walls. Bulletin 70-5 describes it. Pattern comes in galvanized and black steel too. **(94)**

MATERIALS HANDLING TRUCK called the Moto-Bug can be provided with three easily interchanged attachments—hopper, platform, and forklift. —for one standard chassis. Originally introduced as a power wheelbarrow, it is described in release from Koehring Co., Milwaukee, Wis. **(95)**

PRODUCTS & SERVICES offered by Thermal Research and Engineering Corp., Conshohocken, Pa., are outlined in a recent brochure. It shows how many combustion and heat transfer problems can be solved by applying "high velocity" techniques. It is said to be results of jet engine development work. **(96)**

MINERALS PROCESSING RESEARCH done by Battelle Memorial Institute, Columbus, Ohio, is told in booklet recently received. Facilities are described as well as some of the subjects of research projects in the minerals field worked on by the organization. **(97)**

(PLEASE GIVE THIS ADVERTISEMENT TO YOUR BLASTING FOREMAN)

To connect a Branch Line with the Trunk Line

Use this HALF HITCH for Plain and Reinforced Primacord. Draw it up as tight as you can, and be sure the Branch Line leads off at a RIGHT ANGLE to the Trunk Line.

Stray ELECTRICAL CURRENTS DON'T DETONATE PRIMACORD

Unwanted electrical energy is on the increase. The sources are several: a bolt of lightning several miles away, static, radio transmitters, galvanic action, transmission lines, power cables to electrically operated equipment . . . Under certain conditions any of these sources could set off a blast prematurely.

Not so when the holes are primed and hooked up with Primacord. For Primacord is the *insensitive* detonating agent. It cannot be set off by sparks, friction, ordinary shock, stray currents — and *even a direct hit by lightning failed to detonate it!*

Only when the blasting cap is attached at the firing end of the Primacord trunk line is the blast ready to go. And, of course, you do this only when everything's all set.

For more information see your Explosives Supplier, or write to

THE ENSIGN-BICKFORD COMPANY • SIMSBURY, CONNECTICUT

Primacord — Quarrycord — Ignitacord® — Safety Fuse Blasting Accessories — Established 1836

PRIMACORD®

DETONATING FUSE

PROVED AND APPROVED

To connect a Branch Line of Plastic Reinforced or Plastic Wire Countered Primacord with the Trunk Line

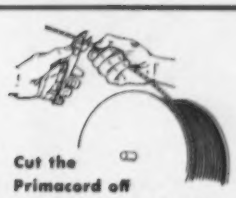
use this DOUBLE HITCH in the textile-covered Primacord Trunk Line. *Draw it up as tight as you can, and make sure that the Branch Line leads off at a RIGHT ANGLE to the Trunk Line.*

To lengthen a Trunk Line

of Plain or Reinforced Primacord, tie a SQUARE KNOT. *Draw it up as tight as you can* — it won't slip back. Caution: don't use any knot in a hole — it might break or hang up explosives when loading.

To connect the Detonator with the Primacord Trunk Line

use FRICTION TAPE. You can detonate Primacord with fuse and cap or electric blasting cap. Lay the cap alongside of the Primacord with the business end of the cap pointing in the direction that the Primacord will detonate. Tape the two snugly together, so that you have a tight connection.



Cut the Primacord off the Spool Immediately

Make this a safety habit! As soon as you have taken off the length of Primacord you need for a down-hole or for a trunk-line, cut it off the spool! Don't waste a second — do it now!

P-19

GISMO METHOD SETS NEW

New Production Records and Drastic Cuts in Man-hour Costs Foreseen!

COULD THIS BE THE BEGINNING of the "Gismo Age" in rock mining? One mine operator has said: "The Gismo is going to revolutionize rock excavation methods in much the same manner that large tractor drawn earth moving scrapers have revolutionized the earth moving procedure."

One new mine being mechanized by the Gismo Method plans to produce 2,000 tons per day at an overall cost of less than $1.00 per ton. Production of ore is expected to be approximately 50 tons per man when the mine is operated on a 2,000 ton per day basis and 57 tons per man when operated on a 4,000 ton basis. The devisor in this case is all of the men to be employed, surface and underground, for production, including supervisors and general foreman.

An older mine, changing over to the Gismo Method, has increased tonnage per man-shift almost 10 times in the stoping operations. Compared to the conventional method used in 1950, the Gismo Method has halved both development and labor costs.

What is this equipment? The Gismo itself is a general purpose utility self-loading transport that is simple, versatile and built to take the punishment of rock excavation. No special development facilities or conditions are usually required. It operates in sloping ore bodies with irregular outlines, as well as large or relatively small openings. With perhaps a few exceptions, the Gismo can be taken into any mine —disassembled easily and quickly if necessary. It loads (mucks) in development or production . . . transports . . . supports 2 to 5 jib mounted drills . . . back fills, moves boulder rocks . . . makes its own roadways and cleans up completely. It can load and transport up to 100 tons per hour with a 300 ft. haul.

It's an extremely simple piece of equipment requiring little maintenance. The Gismo's initial cost can be reasonably compared with one year's maintenance cost alone of much of the conventional equipment in present use.

It makes possible a mining method requiring few machines, few men, less planning and integration. It permits total mechanization of your mine—the solution to high man-hour and materials cost.

We urge you to compare the Gismo Method with other methods—from initial investment to overall effect on your operation's efficiency. Call, wire or write us today! *Sanford-Day Iron Works, Inc., P. O. Box 1511 . . . Telephone 3-4191, Knoxville, Tennessee.*

Sanford-Day IRON WORKS

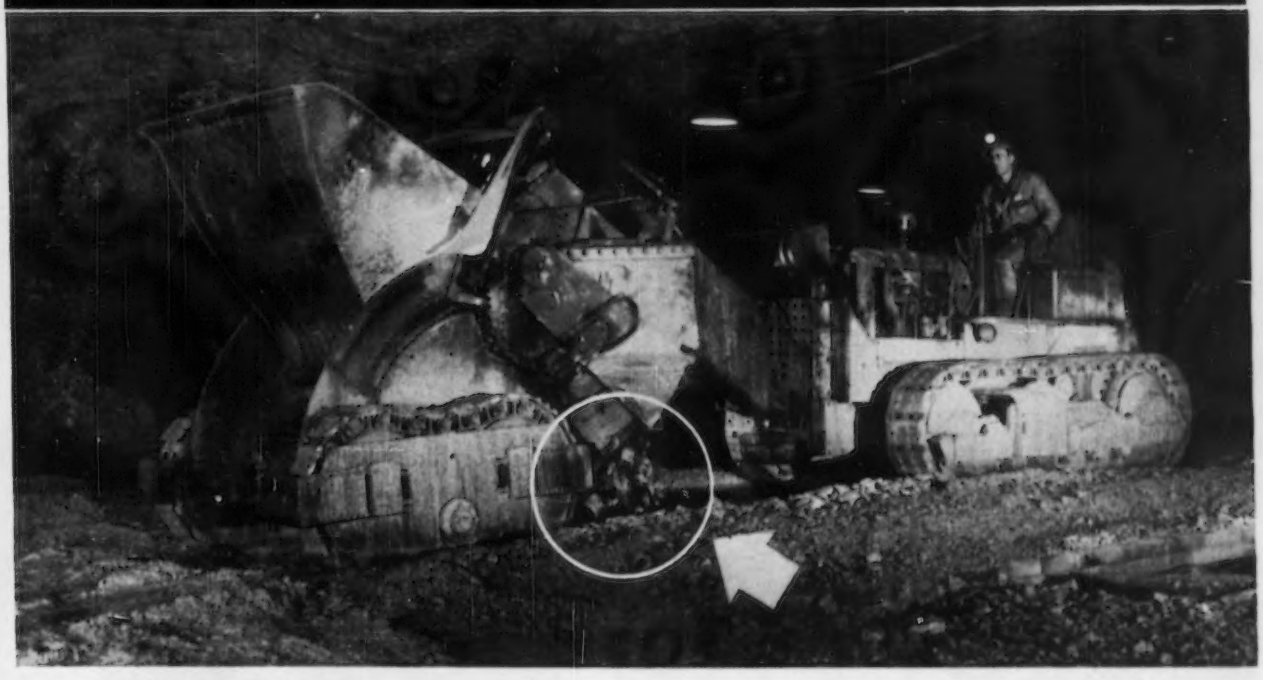
KNOXVILLE • TENNESSEE

AND BROWN-FAYRO DIVISION

MINE CARS, All Types - PRECISION WHEELS - "Brownie" HOISTS CAR RETARDERS - SPOTTERS PUMPS - OIL SPRAY SYSTEMS

LOADING (MUCKING)— a one-man operation! The speed of the GISMO Self-Loading Transport can be fully appreciated and understood only when seen in actual operation. With sufficient ore and ample surge capacity, one GISMO as a self-loading transport and one GISMO equipped as a stope drilling jumbo will excavate out of a hard rock face over 400 tons in a six hour working time shift. The GISMO handles boulders . . . sets them aside for secondary blasting . . . and does not require a bulldozer, road grader or any other accessory device. The operator has complete control of his shoveling grade—can always look directly at the dipper edge. The shoveling action is gentle. Carrying capacity of the GISMO shown working below is 6 tons. Other capacities are available.

GOALS FOR ROCK MINING!



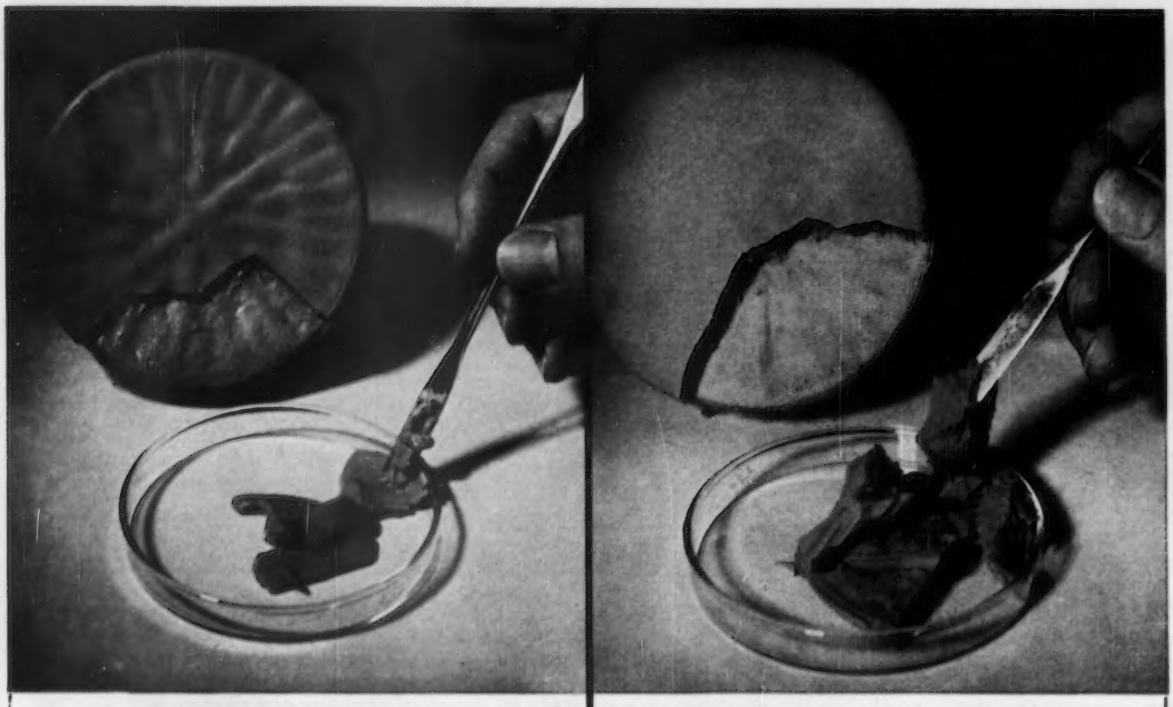
DUMPING: direct into surge pocket . . . skip pocket . . . conveyor for truck loading . . . or mine cars with ramps (for development work). GISMO above is dumping load into surge pocket. Both when mucking (loading material into body of GISMO) and when dumping the load, the dipper or shovel head is in position shown above. The surge pocket disconnects from a time cycle standpoint the next operation, transportation—permitting GISMO and the transportation system to operate independently of each other for maximum efficiency and production.

TRAMMING: fast and highly maneuverable! GISMO shown below is transporting load to a surge pocket. When emptied, GISMO will return to reload with dipper in position shown below. As you can guess, the GISMO is a very simple machine functionally and mechanically. Compared to any other loading or mucking device (none of which are transports), the GISMO has a very large capacity.

DRILLING: The GISMO will mount 2, 3, 4 or 5 drills at ideal locations for the efficient drilling of small or large headings, benches, rib-slabbing or back-slabbing. The GISMO Stope Drilling Jumbo mounting four drills and operated by two men often averages by the month over 400 feet per man shift. The Gismo Drill Jumbo can be easily converted to a Gismo Self-Loading Transport.

Separan 2610

GREATLY IMPROVES FILTRATION



Above picture shows thin cake formed on filter with untreated solids. Cycle includes 15-second cake formation and 45-second drying time.

During the same cycle, a much thicker cake is formed by treating with 0.15 lb. of SEPARAN 2610 per ton of dry solids present.

New flocculating agent speeds up filtration and settling rates, brings many other improvements to liquid-solid separations

THE DOW CHEMICAL COMPANY
Dept. TS-789B-2, Midland, Michigan

Please send me information and a trial sample of SEPARAN 2610.

Name_____

Company_____

Address_____

City_____ State_____

Prove to yourself the advantages of Separan* 2610 in filtration.

1. Increased cake size
2. Decreased cake moisture and better washability
3. Easy to handle and less dusty cake
4. Less material loss in filtrate
5. Effective over wide pH range

Prove to yourself the advantages of Separan 2610 in settling.

1. Up to 40 times faster settling rate
2. Increased overhead clarity
3. Less materials loss in overhead
4. Reduced cost in acid and alkaline media
5. Increased plant capacity

SEPARAN 2610 is highly effective in these industries:

- Uranium
- Clay
- Borax
- Cement
- Alum
- Potash
- Foundry Sand
- Coal
- Phosphoric Acid
- Iron Ore and Taconite
- Industrial Water, and Waste
- Miscellaneous Metals

*Trademark of The Dow Chemical Company

you can depend on DOW CHEMICALS

DOW

YOU CAN DEPEND ON "Eucs"

Mine and quarry operators the world over have standardized on Euclid equipment for moving rock, coal, ore and overburden on the toughest jobs. At this big metal mine in Canada, for example, 12 "Eucs" of 22 ton capacity haul overburden and ore from a pit that's over 100 feet deep and will go down another 200 feet or more. These rugged Rear-Dumps have the stamina to withstand the day after day pounding of heavy excavation loaded by large shovels. With 300 h.p. diesel engines, they have plenty of power for carrying big loads on difficult hauls at travel speeds that mean more loads per hour.

Other Rear-Dump "Eucs" have capacities of 10 to 50 tons . . . engines of 143 to 600 h.p. . . . single and tandem drive axles . . . 5 or 10 speed transmissions or Torqmatic drive . . . spring mounted or semi-rigid drive axles. Your Euclid dealer will be glad to discuss your off-the-highway hauling problems and provide a production and cost estimate for present or planned operations. There's a good chance that he can show you the way to lower hauling costs.

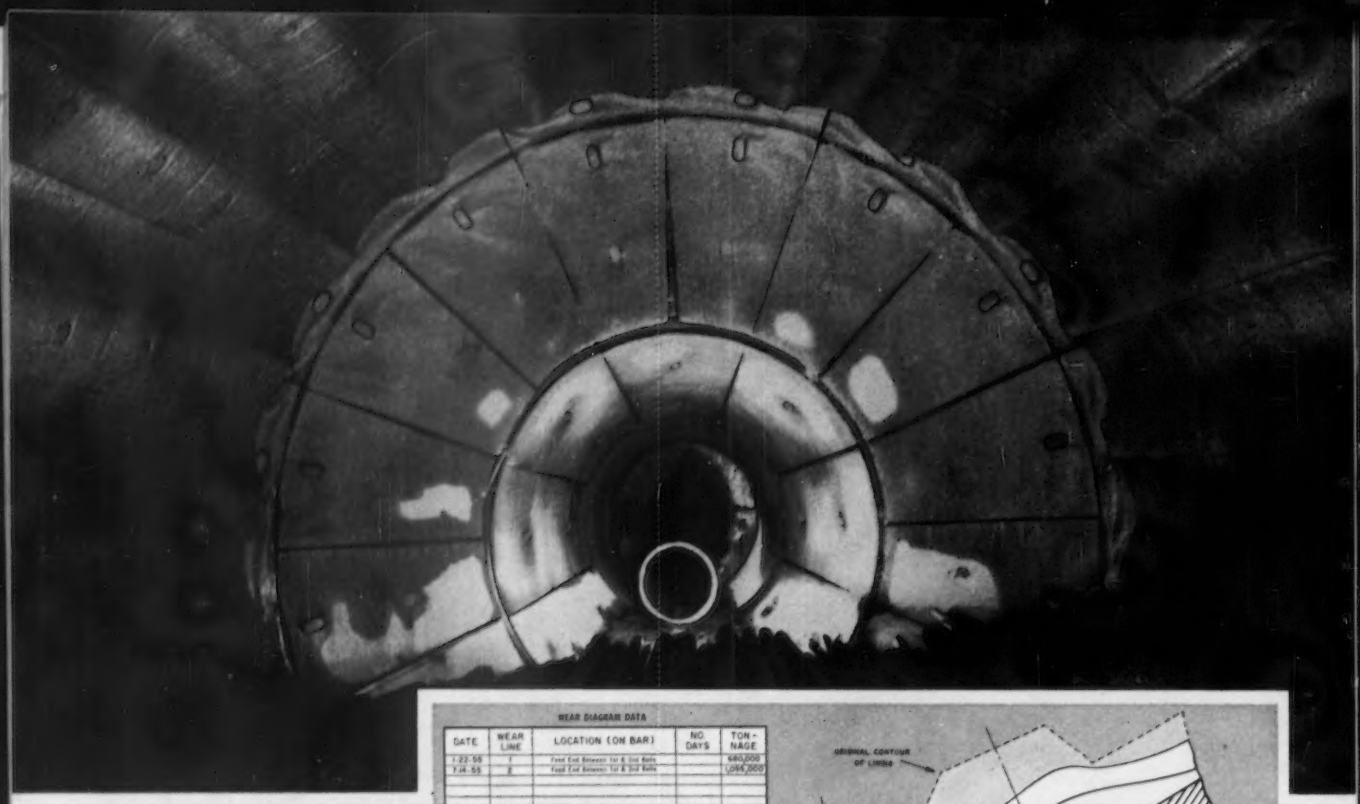
EUCLID DIVISION
GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

Euclid Equipment

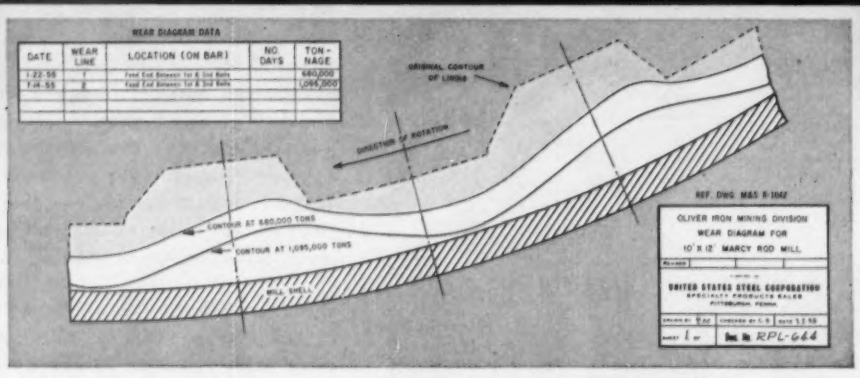
FOR MOVING EARTH, ROCK, COAL AND ORE

EUCLID

GM GENERAL MOTORS



Interior of 10′-8″ rod mill at Oliver Iron Mining's Taconite plant at Mountain Iron, Minn. At time photo was taken, this rod mill had successfully ground 680,000 tons of iron-bearing Taconite ore.



This drawing shows wear contours of the Lorain Linings at 680,000 tons and again after the rod mill had ground more than 1,095,000 tons of ore. Mill was built by Mine & Smelter Supply Co., Denver, Colo.

USS Lining grinds 1,095,000 tons of Taconite before wearing out!

Here are the final figures: 1,095,000 tons of Taconite ground with a USS Lorain Rolled Plate Lining in a 10′-8″ Marcy rod mill at Pilotac . . . the record for rod mill grind in the Iron Range! And the lining *wore* paper thin. There was no breakage or cracking, not even any bolt failures during the life of the lining. What renewal lining was specified? USS Lorain Rolled Plate Lining, of course.

It takes the highest grade lining to give long lasting service like this. Here's why USS Rolled Plate Linings are specially suited for really tough grinding jobs: Liner plates are processed from high carbon steel and the lift bars from alloy steel—both rolled to exacting specifications. The lift bars are heat treated—made harder than the plates—to provide constant lift throughout the lining's service. This means *efficient* grinding during the entire life of the lining. The lift bars and plates are precisely machined to exacting tolerances permitting tight joints, eliminating shell wash. For grinding mills that must operate at peak efficiency with lowest cost per ton of ore ground—always specify USS Lorain Rolled Plate Lining.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS LORAIN ROLLED PLATE LININGS and USS GRINDING BALLS

USS

UNITED STATES STEEL

Improved Du Pont CD Blasting Machines

FASTER OPERATION—LESS MAINTENANCE

Improved performance during an extra-long service life is what you get from the newer Du Pont CD Blasting Machines.

Designated CD-32-1 and CD-48-1, these newly designed machines maintain the condensers in a fully charged condition at all times . . . preventing condenser deterioration and reducing current drain from the batteries to a negligible quantity. This keeps the condensers at the same potential as the batteries. Result: greatly prolonged battery and condenser life, less need for service in the field.

The continuous-charge feature also eliminates the elapsed time between depressing the ready switch and the lighting of the neon lamp. As soon as the ready switch is pressed, the light glows, and the blast can be fired at once by pushing firing button. Result: faster operation.

These powerful, efficient machines retain the excellent characteristics of all CD Blasting Machines: lightweight . . . great safety . . . no moving parts . . . absence of costly permanent shooting lines . . . ability to fire large numbers of caps in series or parallel series.

If you would like complete information on the improved CD-32-1 and CD-48-1 Blasting Machines, see the Du Pont explosives representative in your area, or write to E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Del.

OWNERS OF CD-32 and -48 BLASTING MACHINES may have them converted to the improved CD-32-1 and -48-1 machines for a moderate charge. Ask the Du Pont representative in your area for details.

DU PONT EXPLOSIVES

Blasting Supplies and Accessories

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Heavy fluids can't hinder working parts in these CRANE VALVES

THIS CASE HISTORY tells how the United States Playing Card Co., Cincinnati, solved—with Crane Diaphragm Valves—a costly problem of piping heavy enamels for paper coating.

The trouble was in the plug cocks and conventional gate valves formerly used in the enamel lines. During normal shutdowns the heavy liquid would build up on seating surfaces, in stem threads and working parts. The cocks and gates would "freeze up" . . . were hard to operate . . . couldn't be shut tight. The condition hampered production . . . made floors messy and dangerous . . . pushed maintenance costs sky-high.

Replacing with Crane Packless Diaphragm Valves stopped the trouble completely. Their sealed-to-fluid bonnet and pliable neoprene disc insert did the trick. After more than 4 years, all 48 Crane valves installed—with no maintenance whatsoever—are still seating tight . . . still operating freely and smoothly.

CRANE PACKLESS DIAPHRAGM VALVES

Working parts are safely out of contact with line fluid. The diaphragm seals the bonnet—that's all it does, giving it longer life. The independent disc with pliable insert seats tightly on foreign particles or seat deposits . . . and controls fluid, even should diaphragm fail. See your Crane Catalog or Crane Representative for wide selection of body, bonnet, and trim materials in these valves for countless uses.

CRANE CO.

General Offices: 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • KITCHENS • PLUMBING • HEATING

CRANE'S FIRST CENTURY . . . 1855-1955

BETTER SAFETY... HIGHER OUTPUT

with this modern method of roof-support

By anchoring layers of rock above haulageways and at other critical locations, the Bethlehem square-head roof bolt is helping to make mines safer, and more productive. This method of roof-support also improves ventilation, as there are no bulky supports to hinder air-flow. Production is increased, too, for there is more room in which to maneuver mechanized equipment.

Bethlehem square-head roof bolts come in three types:

(1) A ¾-in. diam carbon-steel bolt. Typical breaking load, 24,000 lb.
(2) A ⅝-in. diam high-strength bolt. Typical breaking load, 24,000 lb.
(3) A ⅞-in. diam high-strength bolt. Typical breaking load, 45,000 lb.

All three bolts are used with Bethlehem's Type C leaf-type malleable-iron shell (with steel plug), and hardened washer. When bolt is tightened in 1⅜-in. diam hole, the plug is drawn down on the threads, expanding the shell so that it locks against sides of the hole. The hardened washer reduces friction between the bolt head and the roof plate, which is caused by high tension in the bolt producing excessive bearing pressure. Because of the washer, impact wrenches can be used freely, without galling or tearing of metal.

We'll be glad to talk over with you the benefits to be derived from a roof-bolting program in your mine. Just get in touch with the nearest Bethlehem office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM MINE ROOF BOLTS

BETHLEHEM STEEL

SUPERMARKET FOR METALLURGISTS

Cyanamid Offers You a Wider Selection of Versatile Cyanidation and Flotation Reagents than Any Other Chemical Supplier

From Cyanamid's long line of basic metallurgical chemicals, you can select exactly the right combination of reagents for highest recovery at lowest cost. In addition, you can get the very practical help of a Cyanamid Field Engineer right at your own property for the most efficient application of these reagents.

By ordering all your basic chemicals from Cyanamid you can simplify purchasing, minimize your inventory and often benefit by lower transportation costs on combination shipments.

And, best of all, you have the assurance of dependable supply from strategically-located plants and warehouse stocks throughout the mining world. *Remember—for nearly 40 years—no Cyanamid customer has ever had to curtail mill operations for lack of Cyanamid Reagents!*

CYANIDE

AERO® Brand Cyanide has been extensively used the world over for nearly 40 years. It is metallurgically efficient, has a protective alkali content that usually reduces lime requirements, and is clean and easy to handle. We also supply white cyanide.

PROMOTERS

Literally, we make dozens of promoters—by far the greatest variety available from any supplier. From our comprehensive group you can select a promoter or promoter combination exactly suited to your job. Among the most popular Cyanamid promoters are

AEROFLOAT® Promoters

Liquid AEROFLOAT Promoters have for years been recovering a very high percentage of the world's copper, lead and precious metals. Used alone and with other promoters, they are perhaps the most popular flotation reagents ever developed.

Cyanamid currently offers five Liquid AEROFLOAT Promoters (15-25-31-33- and 242) with gradations in both promoting and frothing characteristics. All are selective rather than bulk sulfide promoters. They also reduce frother cost. May we suggest testing *all* the Liquid AEROFLOAT Promoters in various combinations and with other reagents?

Dry AEROFLOAT Promoters comprise a series of seven reagents developed to provide powerful, selective promoting with little or no frothing. They are usually fed in 5% to 10% water solutions and are frequently used as "boosters" for Liquid *AEROFLOAT* Promoters or in combination with xanthates or Cyanamid 400 Series Promoters. Very large tonnages of copper, zinc, gold and silver ores are being floated with *AEROFLOAT* 208, 211, 226, 238, 243, 249 Promoters and *SODIUM AEROFLOAT®* Promoter.

AERO Xanthates*

Cyanamid offers a complete line of AERO Xanthates including ethyl, butyl, isopropyl, and amyl xanthates for sulphide and native metal flotation. *Xanthates and AEROFLOAT Promoters are the most widely used metallic mineral collectors.*

AERO Promoter 404*

AERO Thiocarbanilide 130*

AERO Promoter 404 was developed originally for floating lead carbonate without the use of a sulphidizing agent. It is used in addition, for oxide copper flotation after sulphidization, and as a secondary promoter together with xanthates and the AEROFLOAT Promoters. AERO Thiocarbanilide 130 is a more-readily dispersible form of thiocarbanilide, used for many years in base-metal sulphide flotation.

Non-Metallic and Metallic Oxide Promoters

Cyanamid has available fatty acid promoters of the 700 Series, as well as oleic acid.

The 800 Series sulphonate promoters are widely used for flotation of iron-bearing minerals from glass and ceramic raw materials, and for flotation of rhodochrosite and spodumene, as well as several other non-metallic minerals.

AEROMINE® 2026 Promoter is a cationic collector widely used throughout the Florida phosphate field for flotation of silica.

FROTHERS

The AEROFROTH® Frother family includes four products for solving your frother problems. AEROFROTH 65 Frother is a water-soluble product which can be accurately metered to the flotation operation as a solution. It offers considerable advantage from the standpoint of saving on frother consumption. Also available are the alcohol-type products, AEROFROTH 63, 70 and 77 Frothers, as well as pine oil and cresylic acid.

MODIFYING AND DEPRESSING AGENTS

600 Series AERO* Depressants are widely used for control of carbonaceous and talcose-type gangue in flotation operations. AERO* Modifiers 158 and 162 are also useful for controlling gangue slimes. AERO Brand Cyanide and sodium cyanide are standards the world over as sulphide depressants.

FLOCCULATING AGENTS

AEROFLOC® Reagents are synthetic, water-soluble polymers which find wide application for improving settling and filtration operations at mining and metallurgical plants.

HEAVY-MEDIA SEPARATION PROCESSES

American Cyanamid Company is the sole, world-wide technical and sales representative for patented Heavy-Media Separation Processes owned or controlled by American Zinc, Lead and Smelting Company. We will be pleased to give you the benefit of our long experience with these processes and to negotiate a license for their use at realistic royalty rates on behalf of the licensor.

* Trade Mark

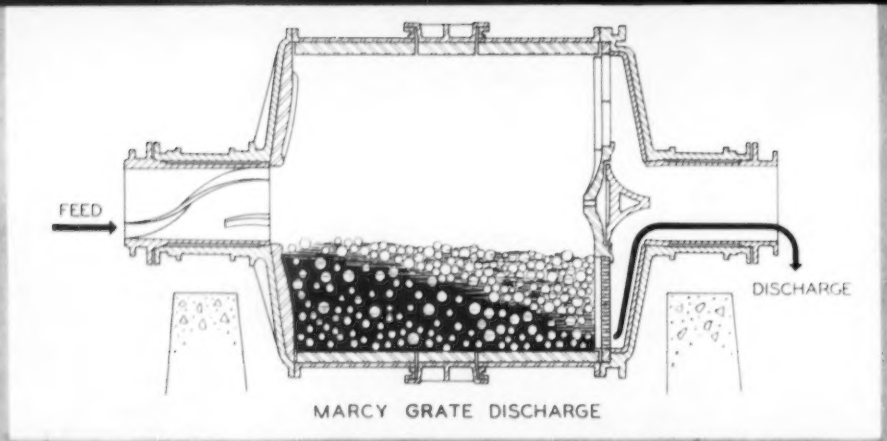
AMERICAN Cyanamid COMPANY

MINERAL DRESSING DEPARTMENT

30 ROCKEFELLER PLAZA, NEW YORK 20, NEW YORK

MARCY Grate Discharge

increases tonnage 25 to 45%
decreases KWH per ton



MARCY GRATE DISCHARGE

"Rapid change of mill content is necessary for high efficiency"... that's the Marcy principle of grinding.

The "rapid change of mill content" is accomplished by use of the Marcy* **full-grate** discharge on ball mills and the **open end** feature on Marcy rod mills. This results in a low pulp line which provides an active, effective grinding mass to act on particle size reduction only . . . there is no wasteful cushioning action by high pulp levels. There is a faster migration of fines than oversize particles, thus less overgrinding. This basic principle of grinding is incorporated in all Marcy Mills and has proved, in hundreds of installations, to give greater output with lower KWH per ton, from 25 to 45% more tonnage compared with the same size overflow mills.

INCREASE IN TONNAGE WITH MARCY GRATES 124% GREATER THAN WITH OTHER GRATES

In seven representative installations where overflow mills were converted to Marcy Grates the average increase in tonnage was 33.6% with a decrease in power of 0.95 KWH per ton. An installation where an overflow mill was converted to grate discharge using another type grate the increase in tonnage was just 15% with a decrease in power of just 0.08 KWH per ton.

WRITE FOR NEW CATALOG NO. 101A

**Marcy is a registered trademark*

The Mine & Smelter Supply Co.

DENVER 17, COLORADO

OFFICES IN SALT LAKE CITY, EL PASO, 1775 BROADWAY, N. Y. C.

REPRESENTATIVES IN FOREIGN COUNTRIES

TRUCO CORING BIT

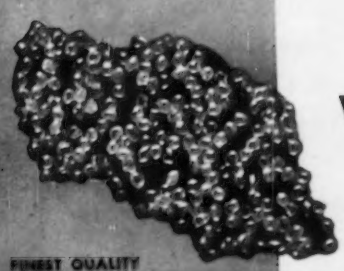
TRUCO CONCAVE BLAST HOLE BIT

TRUCO PILOT BIT

TRUCO IMPREGNATED CORING BIT

TRUCO REAMING SHELLS

TRUCO STANDARD OIL FIELD BIT



FINEST QUALITY DRILL BORTZ

"Bloomin Idol made o' mud— wot they called the Great Gawd Budd"

—KIPLING

The two French soldiers crouched and watched the white little beam of Indian sunlight creep into the eye of the great gilded image across the shadowy chamber. Suddenly, the eye blazed and flashed with brilliant, jewelled fires.

"Diamants!" they whispered, and rushed over and clambered up to the great face. A few moments later they ran out into the turmoil and gunfire in the streets and fled with the rest of the French soldiery, retreating before Captain Clive's victorious Sepoys.

A diamond as big as a walnut and weighing 200 carats isn't the easiest thing to trade, but, eventually, it reached an Armenian dealer who sold it to the Russian Count Orloff for $560,000. The Count diplomatically presented it to the Empress Catherine, who was so pleased that she gave him a half-million dollar grant and another title.

After 200 years, the Orloff Diamond is still one of the world's great jewels. Probably it came from the fabled diamond fields of Golconda which supplied ancient Indian craftsmen with diamonds for their metal-working tools.

And, today, as then, diamonds are still the world's greatest cutting element and in Truco Diamond Bits they provide drillers with the irresistible cutting power for which Trucos are famous—swift, accurate, thrifty, dependable penetration in any formation. Naturally, this cuts rig time and lowers footage costs. May we send you the Truco Drill Bit Catalog?

TRUCO DIAMOND BITS

by

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue, Detroit 38, Michigan

WHEEL TRUEING TOOL CO. OF CANADA, LTD.
575 Langlois Avenue, Windsor, Ont., Canada

HOW TO BUY RUBBER HOSE

FOR EASY HANDLING ON TOUGH JOBS . . .

and get "More Use per Dollar"

Select a light weight hose construction that is flexible and kink resistant for long-life dependability.

Hose that is light in weight—yet strong enough to safely withstand high pressures—is easier to handle. Men like it better and do more work with it. Look for a hose that is light, yet strong, for ease of handling.

If the hose you buy resists kinking you are assured maximum flow under all operating conditions. Hose that is mandrel-made, rather than molded in a pre-set coil, will coil and uncoil freely in any direction . . . eliminate points of strain at kinking points that can cause costly internal damage and rupture.

Make certain the hose is engineered for maximum flexibility . . . from tube to cover. Tube-to-cover flexibility prevents separation of cover, tube or strength member plies . . . reduces hose costs by increasing hose life.

Specify the one hose that gives you all these features . . . specify R/M Homoflex Hose.

HOMOFLEX HOSE

The unique construction of Homoflex Hose makes it easier to handle because it is light, has no pre-set twist . . . coils and uncoils easily without kinking. All unneeded bulk has been engineered out. An exclusive process creates a homogeneous cover, strength member and tube that are virtually inseparable to produce a hose construction that is extremely flexible, yet rugged and strong. Homoflex Hose does a better job under tough conditions . . . and it lasts longer. Inside and outside diameters are uniform.

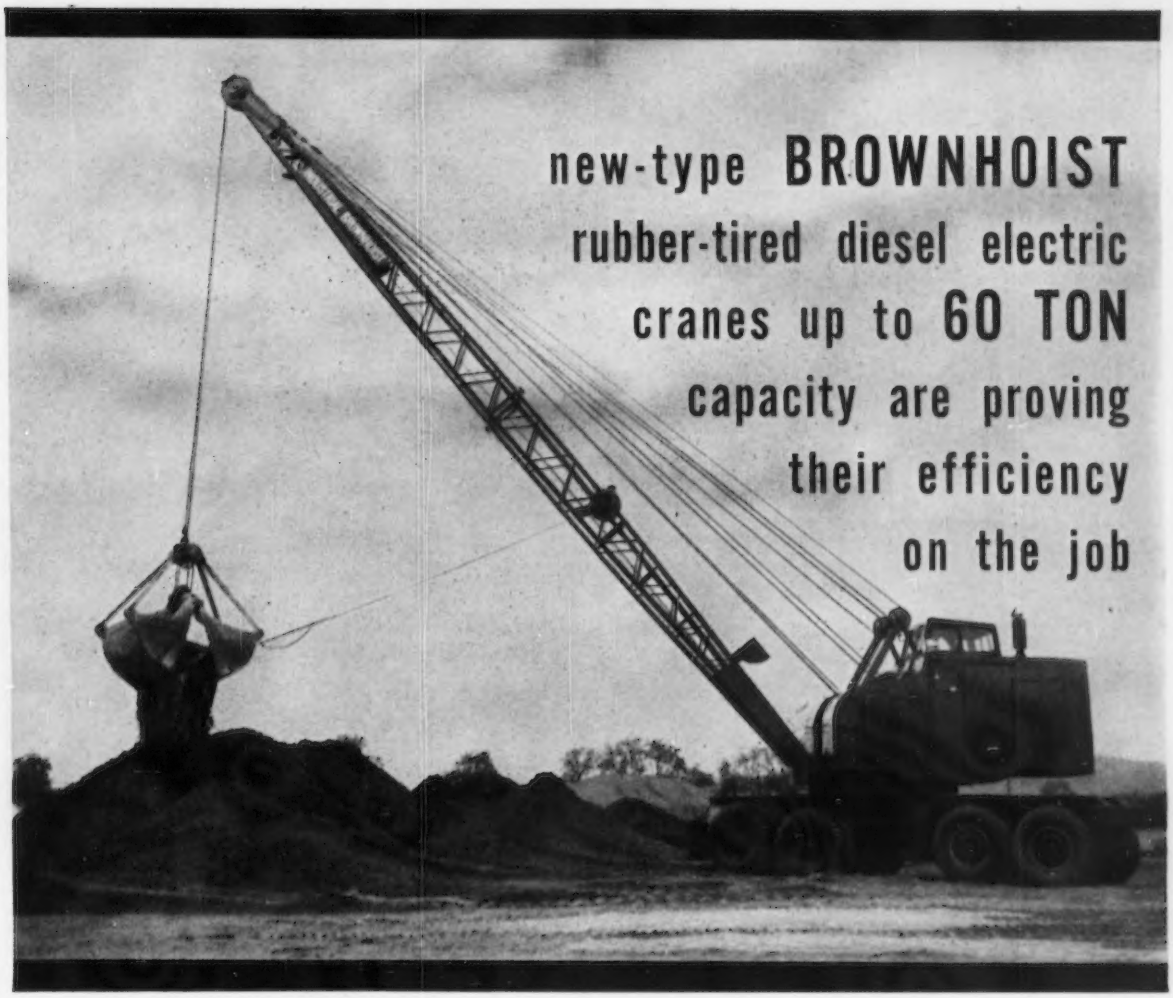
Ask your R/M representative about types of Homoflex Hose for your operations. He can also tell you why other types of R/M Hose for general and special purposes last longer, too . . . give you "More Use per Dollar".

RM-506-UG

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings • Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls



183

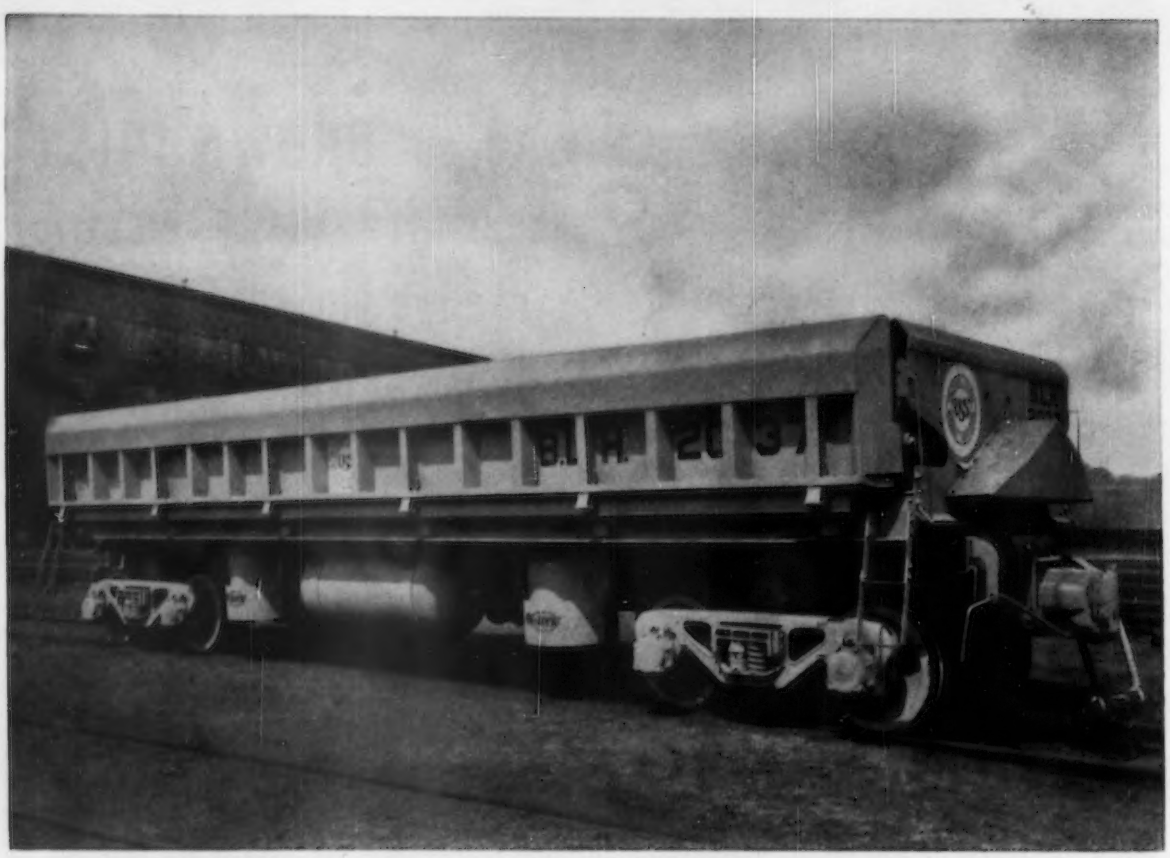
BROWNHOIST MATERIAL HANDLING EQUIPMENT GIVES A LIFT TO AMERICAN INDUSTRY

INDUSTRIAL BROWNHOIST CORPORATION
BAY CITY, MICHIGAN • DISTRICT OFFICES: New York, Philadelphia, Cleveland, Chicago, Denver, San Francisco, Montreal • AGENCIES: Detroit, Birmingham, Houston

The new Brownhoist Wagon-Cranes are specifically designed to do an outstanding job wherever high mobility and high capacity are required. You'll see them at work performing heavy duty jobs in mines, quarries, steel mills, for railroad and lumber operations and for many other large industries. Equipped with dynamatic clutch, anti-friction bearings at all essential points, power steering, electric travel and electric rotation. Mounted on a 12 wheel crane carrier capable of speeds up to 8 miles per hour, the unit can be operated by one man from easy-to-reach controls. Economical to operate. Available in capacities from 25 to 60 tons. For specification folder or further details, get in touch with our nearest representative or write us at Bay City.

SUBSIDIARY OF Penn-Texas CORPORATION

BROWNHOIST



Stands the Gaff. Increase the life of your mine car bodies by designing them to utilize high strength, low alloy steels containing nickel. The car body shown here is one made from TRI-TEN steel, a product of United States Steel Corp., Pittsburgh, Pa. TRI-TEN steel is widely used to meet demands for ruggedness and strength where minimum weight is also a requirement.

Want Longer Lasting Ore Cars?

Bodies withstand impact, abrasion and corrosion when made of high strength, low alloy nickel steels

DON'T INCREASE SECTION THICKNESS to lengthen life of ore car bodies...

Don't add deadweight to strengthen them, even where battering and corrosion now breed maintenance problems...

Increase car life, and at the same time cut maintenance, by utilizing high strength, low alloy steels containing nickel.

These steels give you 50% greater yield point than structural carbon steel. Especially important, they retain a high degree of their original strength during years of use because the resistance they offer to atmospheric corrosion is three times that offered by carbon steel.

In addition, low alloy nickel steels distinctly excel structural carbon steels in resisting impact, wear and abrasion.

Take full advantage of the properties these low alloy nickel steels offer you.

Every mine operator should have a copy of "Nickel-Copper High-Strength, Low-Alloy Steels." It discusses design factors that help you cut weight. It explains why these nickel alloy steels provide superior resistance to atmospheric and many other types of corrosion. It describes their behavior in fabrication.

Write for your copy now. INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

GENERAL CABLE

THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE

resists all hazards far beyond accepted field requirements

SUPER SERVICE

Heavy Duty Mold-Cured Portable Cords and Cables

Constant research . . . both in our laboratories and in the field . . . keeps SUPER SERVICE ahead of your most severe applications.

Result: longer cable life, fewer work stoppages, and improved safety!

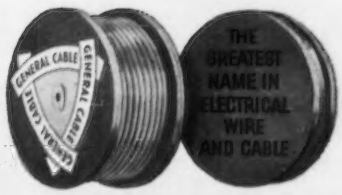
For example, the SUPERTUF neoprene jacket on new SUPER SERVICE resists sleeving, crushing, tearing, abrasion, oil and flame . . . specially reinforced for extra tensile strength.

New THERMAX heat-resistant insulation gives top protection against temporary current overloads.

Combined with extra features such as compact design to reduce sleeving of jacket from core . . . it's no wonder that SUPER SERVICE has become a byword for dependability.

In mining operations everywhere . . . day after day . . . SUPER SERVICE is keeping in check all the costliest hazards. Why settle for less? See your friendly General Cable Representative today!

GENERAL CABLE
CORPORATION



BARE, WEATHERPROOF, INSULATED WIRES and CABLES FOR EVERY ELECTRICAL PURPOSE

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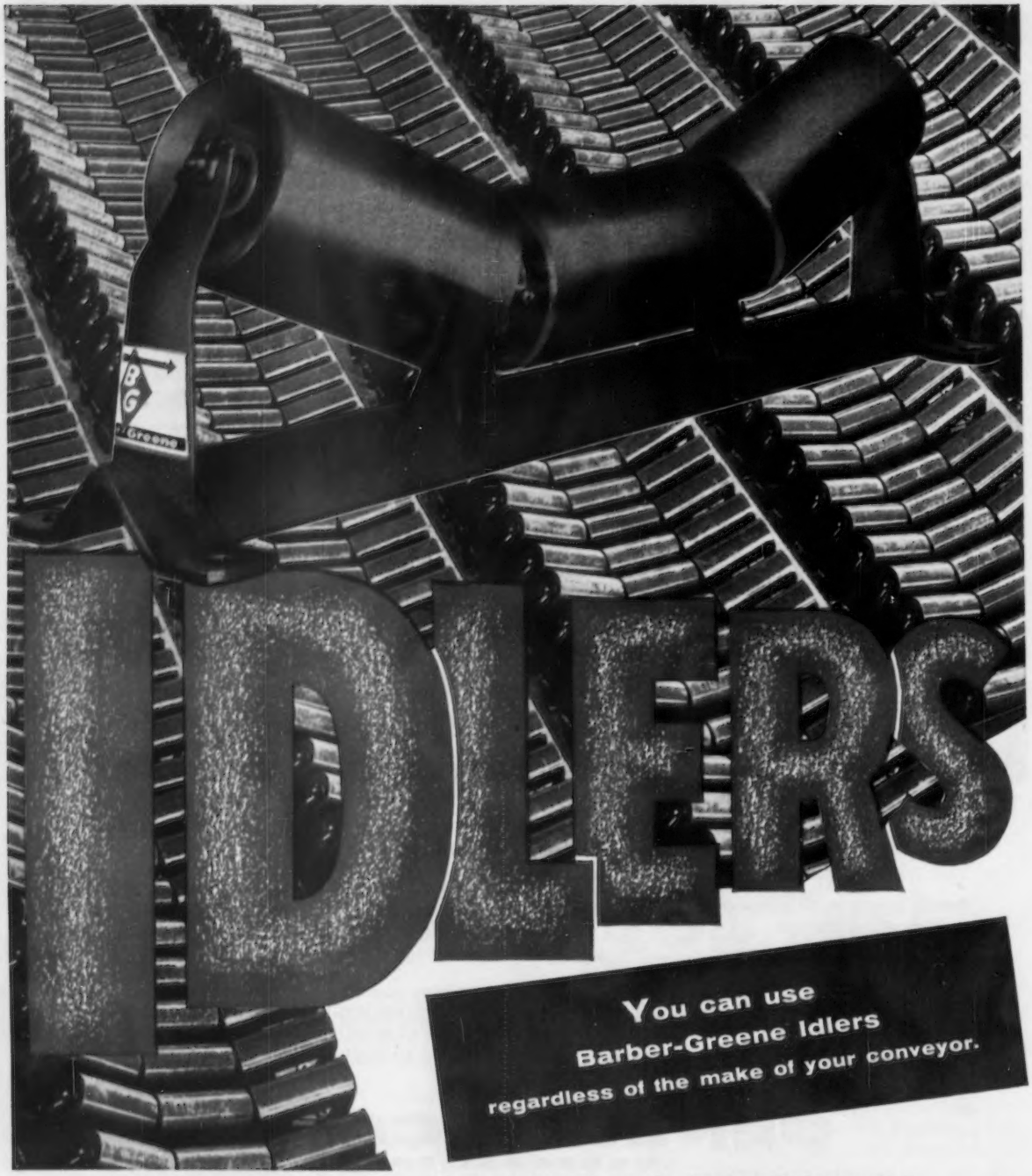

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CONVEYORS LOADERS DITCHERS ASPHALT PAVING EQUIPMENT

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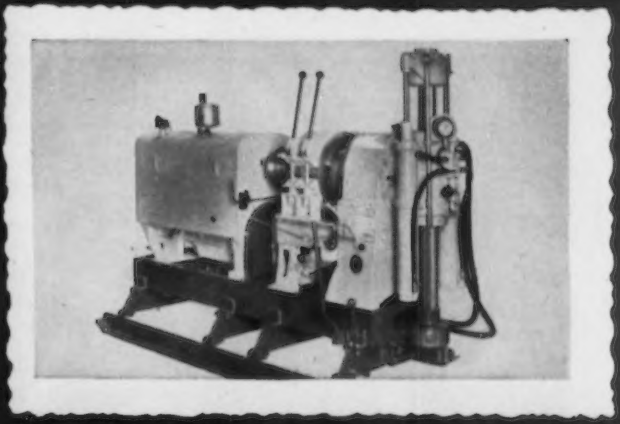
Longyear

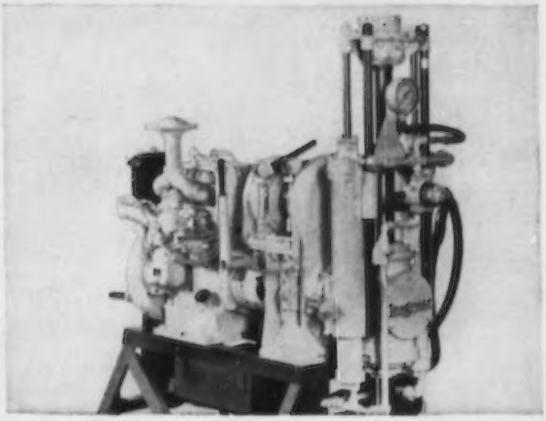
core drill

A Longyear drill for every job

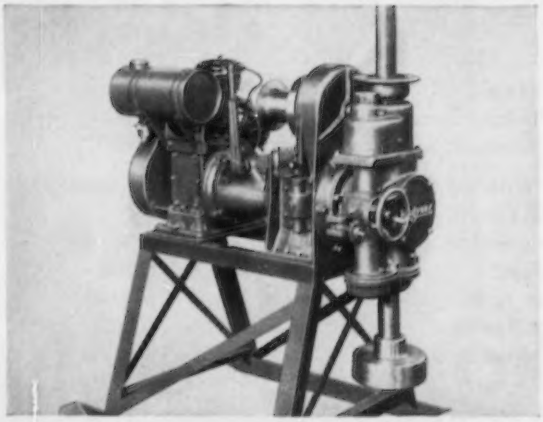


The "44" heavy duty drill
capacity 4000 feet of AW rod

Junior Straitline
capacity 1350 feet of EW rod



The "24" drill
capacity 750 feet of EW rod



The Prospector
capacity 325 feet of EW rod

The Porta
capacity 200 feet of XRT rod

E. J. Longyear Co. MINNEAPOLIS, MINN. · CABLE LONGCO
CANADIAN LONGYEAR LTD., NORTH BAY, ONTARIO · LONGYEAR ET CIE., PARIS, FRANCE

FAST!

that's the word for Bucyrus-Erie dig-swing-dump cycle

High-speed performance in Bucyrus-Erie excavators doesn't depend entirely on super-skilled operators or ideal digging conditions. It's the result, too, of engineering that offers features like these: anti-friction bearings to smooth the path of power . . . fast-acting controls that are pinpoint accurate and easy to operate . . . big, generously-designed clutches and brakes that deliver instant response with an extra margin of safety . . . strong, lightweight front end that puts power to work swinging payload, not deadweight . . . wide, ground-hugging treads with large bearing area for the kind of stability that makes rapid operation possible.

With all their speed of operation, Bucyrus-Erie excavators still deliver long life and low maintenance. Mining and quarry men have learned to depend on Bucyrus-Erie machines—from ⅜ to 4-yd.—for efficient, low-cost production. See your nearby distributor soon for complete details. 122E55

BUCYRUS ERIE
South Milwaukee Wisconsin

1880 75 1955
YEARS OF SERVICE to Men Who Shape the Earth

WE WANT YOUR TOUGH JOBS!

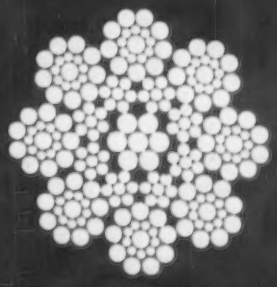
for J&L CenterFit Wire Rope

Three characteristics give J&L CenterFit Wire Rope the staying power to develop outstanding service in applications where shock, fatigue, and heavy loading limit the service life of standard wire rope.

1. CENTERFIT is the strongest standard rope produced.
2. CENTERFIT is more flexible in operation than any standard IWRC rope.
3. CENTERFIT has unsurpassed resistance to shock loading.

Over the years CenterFit has built a record for outstanding service life on the toughest applications such as shovel hoist ropes, back hoe pull ropes, and clamshell holding and closing lines where overloading is a factor.

If you're operating where loading, shock and fatigue are severe, chances are J&L CenterFit can help you cut your wire rope costs. Contact your nearest J&L Office or representative.



Jones & Laughlin
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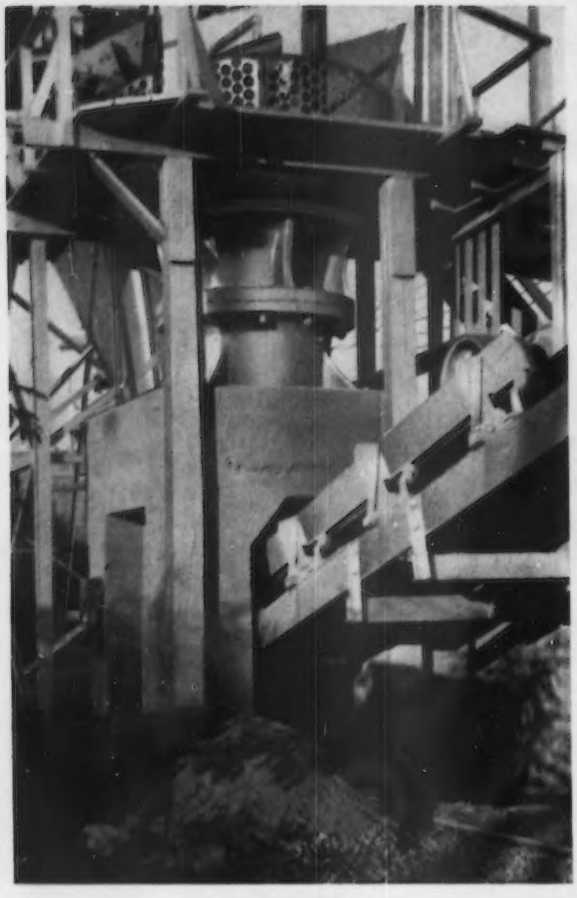
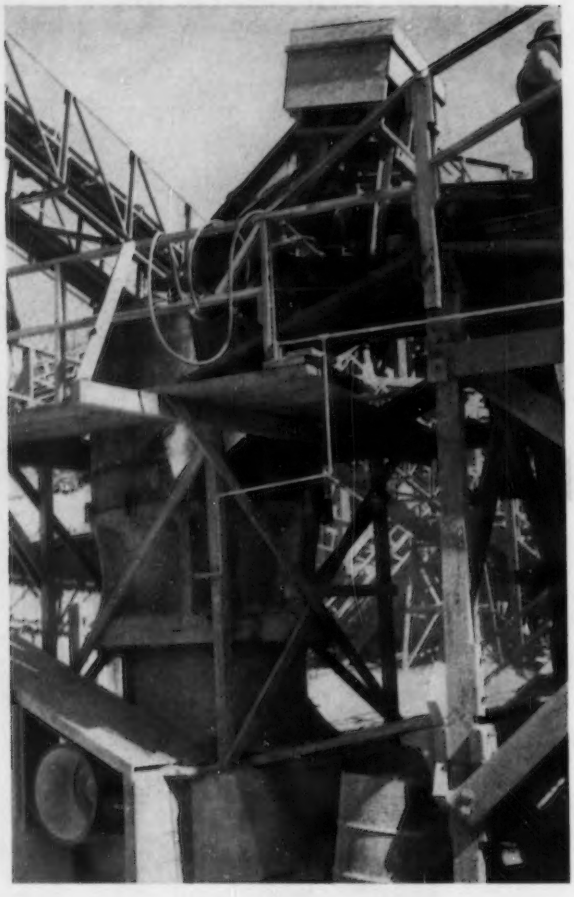




Here's why 836 Operators said:
"Buy a Traylor TY Reduction Crusher"

There must be a mighty good reason why so many operators the world over would decide to buy the same machine . . . a Traylor TY Reduction Crusher.

There is. It's a matter of costs. Not first costs that occur once . . . but operating costs that go on year after year.

Low-cost operation is the big reason 836 operators decided on a Traylor TY.

A Traylor TY is a heavy duty machine built with an eye to the future. It boasts of many, many features such as bronze lined eccentric . . . spring mounted suspension . . . short head. The result is less down-time, increased production and reduced power requirements with a Traylor TY.

The full story behind the decision of hundreds of profit-wise ore producers to buy a Traylor TY is told in Traylor Bulletin 7112. Write for your copy today.

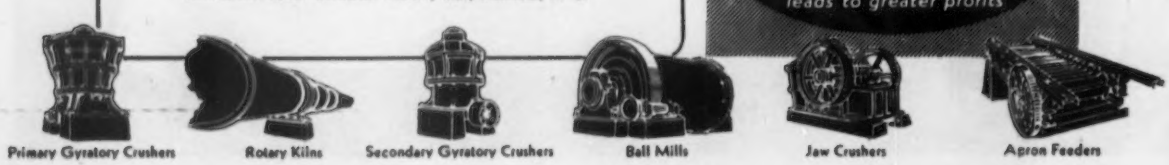
TRAYLOR ENGINEERING & MFG. CO.

1752 MILL ST., ALLENTOWN, PA.

SALES OFFICES: New York • Chicago • San Francisco

CANADIAN MFRS: Canadian Vickers, Ltd., Montreal, P. Q.

A Traylor leads to greater profits



Primary Gyratory Crushers | Rotary Kilns | Secondary Gyratory Crushers | Ball Mills | Jaw Crushers | Apron Feeders

THERE'S AN EIMCO TO FIT YOUR LOADING JOB

There is an Eimco loader for your loading job. Small or large tunnels, drifts, slopes, inclines, haulage ways, overburden, cleanup, road building, clearing slides or any loading job that requires speed, economy and continuous operation with minimum machine attention.

Eimco loaders are available with wheels for rail type operation and crawler mounts for trackless work. They are self propelled by air, electric and diesel motive power, depending on their type of application.

Eimcos are proved loaders — more of them are in daily use on hard rock mining jobs throughout the world than all other brands of mechanical loaders combined. Many of these have been in continuous operation for more than 20 years.

An Eimco is always your most economical loading machine. Write for details.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

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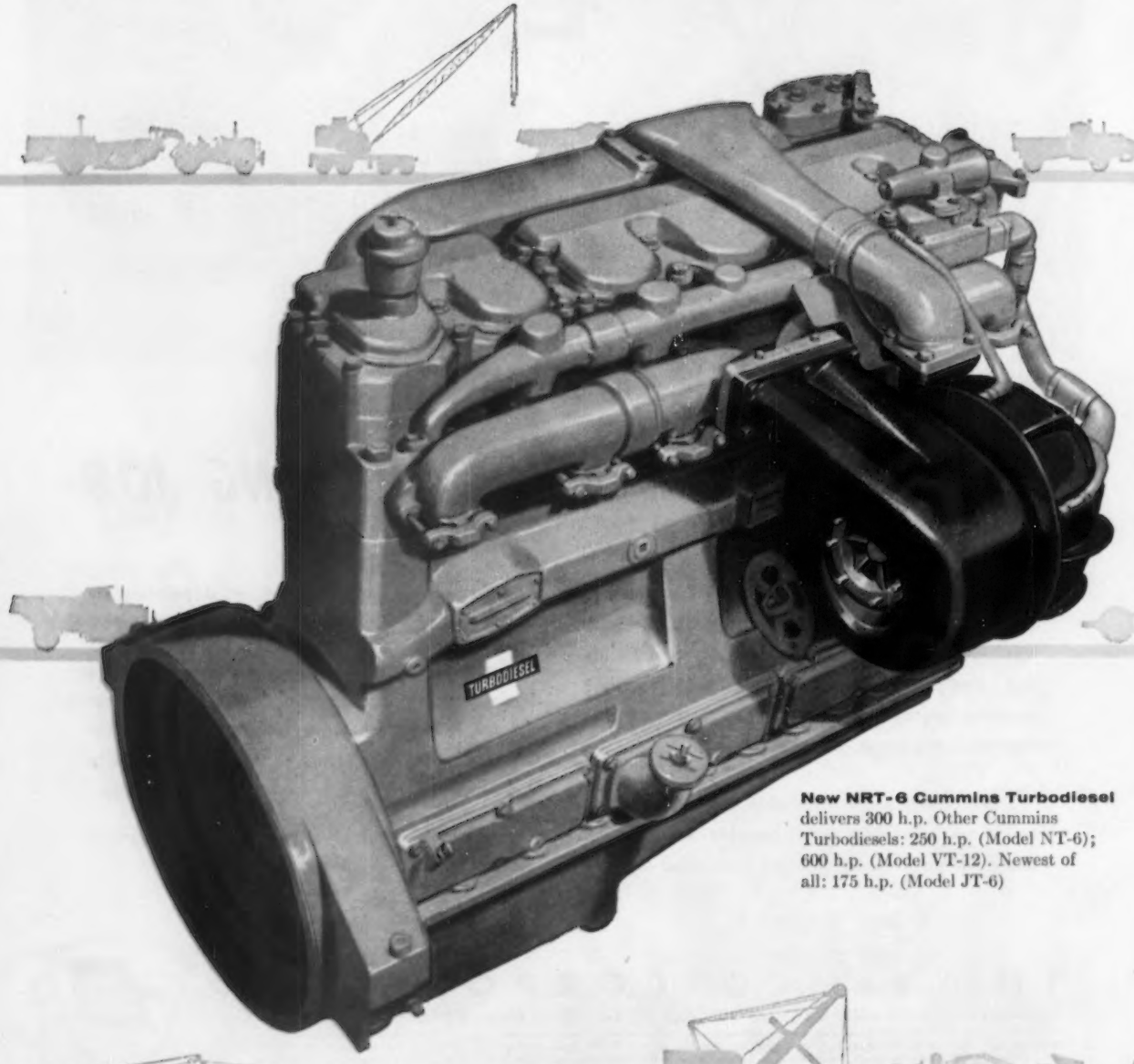
EIMCO

B-194

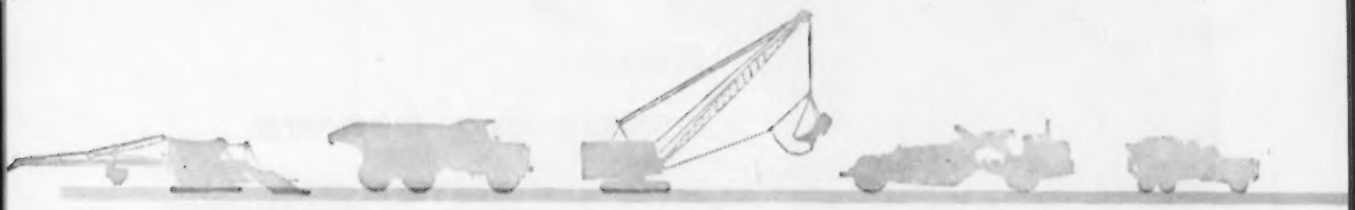
Now available in all kinds of mining equipment...

NEW CUMMINS



New NRT-6 Cummins Turbodiesel delivers 300 h.p. Other Cummins Turbodiesels: 250 h.p. (Model NT-6); 600 h.p. (Model VT-12). Newest of all: 175 h.p. (Model JT-6)

TURBODIESELS



POWER!.....PERFORMANCE!.....PROFIT!

Here's a new power concept to make *your* mining jobs more profitable. Cummins Turbocharging brings you extra diesel horsepower without added engine weight by harnessing the energy in normally wasted exhaust gases . . . boosting engine efficiency.

Field tests on all kinds of mining and construction jobs show significant savings in time, fuel and equipment. And like all Cummins Diesels, the new Turbodiesels feature the simple to understand and service PT fuel system and easy-as-gasoline maintenance. Added time-saving economy feature: Cummins nationwide distributor system makes sure that factory-type service and genuine Cummins parts are always near *your* operation.

No wonder *more and more mining men are standardizing on Cummins Diesels.*

CUMMINS diesels give you the big plus **MORE PROFIT**

Cummins Engine Company, Inc.
Columbus, Indiana

I am interested in finding out more about the advantages of Cummins Turbodiesels. Please send me:

_____Your directory of manufacturers offering Cummins Diesels in their equipment.

_____Your booklet illustrating Turbodiesel principles.

I am interested in converting my present equipment to Turbodiesel power.

_____Please have your representative call.

Name_____

Position_____

Company_____

City_____ State_____

EM-11

Aero mapping crews are overhead in Egypt

Now AERO mapping crews are speeding the search for oil in Egypt.

Many strange and distant lands are "home" to AERO crews, who survey anywhere in the world. Exploring for petroleum and minerals . . . mapping for highways, railroads and pipe line locations . . . conducting resources inventories . . . aiding plans for cities, states and nations . . . these and other mapping projects go smoothly and swiftly in the hands of AERO—pioneer and leader in aerial mapping.

In the planning stages of your next project, it will pay you to call in AERO engineers, whose more than 2,000,000 miles of experience can save you time, money and manpower.

AERO SERVICE CORPORATION

PHILADELPHIA 20, PENNSYLVANIA

Oldest Flying Corporation in the World

Offices in TULSA, DULUTH, SALT LAKE CITY, SAN FRANCISCO, JOHANNESBURG
Our Canadian affiliate is: CANADIAN AERO SERVICE, LTD., OTTAWA

AIRBORNE MAGNETOMETER SURVEYS
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PRECISE AERIAL MOSAICS
TOPOGRAPHIC MAPS
PLANIMETRIC MAPS
RELIEF MODELS

ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

This is the Coppus VANO. The propeller-type, best for shorter pipe lines, medium pressures.

This is the Coppus VENTAIR. A centrifugal blower, it is designed for long pipe lines, high pressures.

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ENGINEERING AND MINING JOURNAL

NOVEMBER 1955

Engineering in the Outfield

THERE MUST BE AN OVERSUPPLY of grey flannel suits in the mining industry today—or more accurately, a shortage of men qualified to wear the grey flannel suits. Executive talent certainly seems scarce. From management consultants, mining schools, and the companies themselves we hear of openings in key managerial positions that can't be filled even after months of looking.

The hunt for men to fill these positions is intense but the prime hunting ground has been the offices of other mining companies. Net result is an unsatisfactory, indirect swapping of talent; in effect we wind up trading a left-handed pitcher for a good hitting first baseman, which may be all right if we can afford to lose the pitcher.

Oddly enough the analogy to baseball, at least to the business side of the national pastime, points the way to solutions of the manpower situation in the mining industry.

For example, you've never heard of a major league team using a center fielder to collect tickets or using a shortstop as a batboy. Yet that's what we do when we waste an engineer's training and potential in jobs that could adequately be handled by lesser trained technicians. Last month we discussed where to get such technicians and the jobs that they can handle to free the engineer for true engineering and permit him to develop into an executive. This approach has two important effects: It increases the number of engineers available for engineering work and it makes mining more attractive to the alert ambitious young man who is determined to avoid the routine job beneath his ability.

An even more effective remedy for the manpower situation, which flourishes in the baseball world, is the "farm system." Promising ball players are farmed out to minor league teams where they have a chance to improve, are given further training, and are groomed for the big leagues. The system has been eminently successful in keeping the baseball industry supplied with talent. Why shouldn't it work in the mining industry?

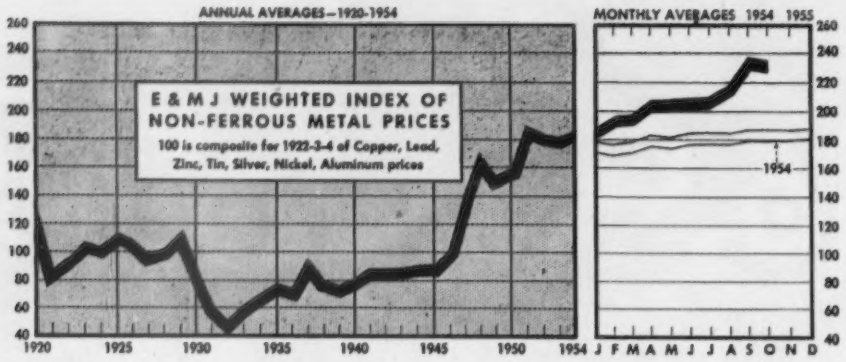
The almost frantic search for major league mining talent now going on indicates that there has been little long range training being given by the mining companies to potential management material. Frankly we don't understand why this should be true in an industry whose resourcefulness in solving other problems in its field frequently borders on the miraculous.

Our mining industry "farm system" would include a recruiting of candidates, a competitive range of salaries, and a thoughtfully laid out program of continual advancement for those who qualify at each step up the ladder. Included would be on-the-job training as well as outside courses in such important facets of an executive's job as labor relations, business administration and finance. The end product of such a system would be a broadly trained man, able to take over almost any position on the company's executive team.

A broad program of this nature would enhance the mining industry's opportunity of getting recruits for the industry. The problem would then be one of making young people aware of the attractive climate for engineers and the steadily growing, exciting challenge in the mining industry.

E&MJ OUTLOOK

PRICES



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MARKETS

The steady rise in major non-ferrous metal prices was checked during October causing *E&MJ*'s index to drop 1.8 points to 234.64. Copper's slight decline to 43.03c for the month was the chief factor.

The recent slight drop in secondary aluminum prices may mean that the tight aluminum supply situation is easing a bit.

Platinum prices moved up $6 to $97 per oz for bulk quantities. Indications are that Russia is selling less and will continue to do so.

A prolonged high use of Special High Grade zinc is expected, chiefly due to die casting requirements of the automobile industry. The recent increase in the premium of Special High Grade over Prime Western from 1½c to 1¾c reflects higher production costs.

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LABOR

For the first time in its 63-year history, **Mine-Mill** has denounced Communism. This is thought to be a defensive maneuver to fight Justice Department's charges that Mine-Mill is Communist dominated. See p 120.

●

AT HOME

Watch borax. Heavy demand since the war is likely to increase still further. Pacific Coast Borax Co. will soon start an $18-million construction and expansion program. Completion is scheduled for mid-1957.

Anaconda's Bluewater, N. M., plant stopped accepting uranium ore for AEC's account after Oct. 20. Reason—production from Anaconda's Jackpile mine will take up most of the refinery capacity.

Justheim Petroleum has applied for patents to extract oil from shales in place with the use of heat generated by a small nuclear reactor.

For the first time in 15 years the Census Bureau of the Department of Commerce will release figures on the domestic mining industry. See p 119.

The accent is now on metals and combinations of new metals that will stand up in nuclear reactors. The field is just being tapped. Some metals deteriorate when exposed to nuclear bombardment, and others improve markedly.

●

ABROAD

Lindsay Chemical Co., West Chicago, Ill., has taken a two-year option on an 18-claim monazite property in the Lake Athabaska district of Saskatchewan. Preliminary exploration has opened a vein averaging 12 ft wide assaying about 15% monazite. Thorium content runs a little over 1%. Charles Lindsay III, company president, said "We are constantly looking for new deposits such as this."

Gunnar Uranium is opening up a surface deposit containing more than 160-million tons of blocked-out rich uranium ore on the shores of Lake Athabaska, Saskatchewan.

Copper Prices Ease Slightly But Chilean Strikes Bring Uncertainty

ECONOMIC ACTIVITY in October continued at the highest levels the country has ever reached. The Federal Reserve Board's index of industrial production was at 141% of the 1947-49 average in September and with a pick-up in automobile assemblies in October following the model changeover, and steel in October also up, there is a possibility the index will be at 142 in October.

Nonferrous metal prices declined slightly in October, though they were far above any month except September. In October the *E&MJ* metal price index dropped back to 234.64, owing mainly to copper declining to 43.03c, f.o.b. refinery.

Copper prices in the U. S. and abroad eased during October; the average for the month is about 1c below September, for both. This reflects a widespread belief that current output is as great as consumption and fabricators will be able to partly rebuild depleted inventories. The inventory shortage is of two sorts: the ratio of inventories to fabricating operations is well below that which most fabricators feel is advisable, and for many firms inventories built in earlier years at prices as low as 12c have been reduced and profits for calculating income taxes will need to reflect the spread between these low prices and current high prices of fabricated products. The shortage of fabricator stocks as a ratio of operations is probably about 65,000 tons in the U. S. —this assumes that the figure of 334,996 tons for fabricator stocks for the end of September will be unchanged. Most factors believe this reasonable; the increase of about 30,000 tons in stocks in September reflected disruption of operations by storms in the Connecticut Valley and is not likely to be repeated in October. The shortage of copper for Lifo purposes may be about 25,000-35,000 tons.

With the edge taken off the copper market, the spread between the price charged by nearly all regular sellers and the maximum price, was reduced. The former, in the U. S., remained at 43c delivered and the others dropped from a high of about 53c to about 46c. Strikes at all three major copper mines in Chile on the last day of October (rumored settled on Nov. 2) reversed the trend in copper prices and the London Metal Exchange bounced up to £370 bid (46.3c) at the official session, £12½ above the previous price.

The sharp controversy over copper pricing policy cooled somewhat with the reduction in the spread. Nowhere did the significant fact about this matter come out: the nature of the firm determines in almost all cases the policy that is followed. The object of all the firms on both sides of the matter is identical—to make "optimum" profits. In most cases this means long run maximizing of profits. Opposite price policies will achieve the same objective for different firms. In general, those firms with long run interests in the copper industry are most reluctant to let the price go through the sky. Those firms with highly diverse interests and with investments in copper of a sort that can be liquidated rapidly and switched to other industries or products normally advocate charging maximum prices at all times. In those few cases in which a firm does not appear to fit these conditions it probably indicates management assesses the affects of the policy differently from those of most firms in the similar situation. It is widely held the long run supply of copper as well as the short run supply would not differ much whether the price was 40c or 50c in the middle of 1955; high prices will bring out more copper, but there is some price beyond which further price increases will have little effect. And there is some price beyond which further increases may mean a decreased supply in the long run—decrease owing to a falling demand resulting from substitution of other materials. Copper selling firms with long run interests in the industry are concerned about this—those without long run interests are generally not concerned about it.

As October ended there was uncertainty about the copper market. Major custom smelters were at 45c and 45½c but were not selling enough, owing to metal scarcity, to have much effect on the average price. With the strike in Chile, rumors of more trouble in Rhodesia and the upward jump of the LME, there are prospects that prices will rise. But most opinion holds these events will be short lived. In September, U. S. crude output was 94,755 short tons, crude secondary 12,735 tons, refined 139,880 tons, and shipments to fabricators 144,571 tons. Outside the U. S. the comparable figures were: 141,165 tons, 1,049 tons, 108,601 tons and 117,547 tons.

Zinc was raised by Eagle-Picher from 13c to 13½c a lb Monday, October 17, following optimistic talks by Government representatives at the Mining Congress meetings in Las Vegas. The continued strong demand for zinc, prime western as well as special high, suggested that such a price rise was in order, but most other firms failed to follow. The fact that foreign zinc was available here at concessions of $5 or $10 a ton, as well as the failure of the LME to move up, convinced many companies that the market was not prepared to accept the higher price.

The price rise brought immediate denunciations from spokesmen of the die-casting industry. Following the announcement of the price rise large tonnages were sold at the 13c price and so little was sold at 13½c it did not effect the *E&MJ* weighted average. All sellers dropped back to 13c.

In the October 6 issue of *E&MJ Metal and Mineral Markets* we pointed out that there was considerable possibility of increasing the spread between prime western zinc and special high grade. Cost increases, as well as demand conditions, indicated the possibility. Beginning Oct. 20 the American Smelting and Refining Co. raised the differential from 1½ c to 1¾c a lb. By the end of the month nearly all sellers had indicated they would go to the new price. It is expected to be general by Dec. 1; it had been 1½c since Jan. 1, 1951.

As the month ended zinc was as tight as ever.

Lead remained at 15½c throughout the month, buying was heavy and there was no doubt the price would be sustained for some time. Mine output reached 50,453 tons in Sept. and domestic shipments 46,250 tons. Stocks dropped to 30,753 tons.

Aluminum is still tight and premiums on secondary remain high. In September

Average Prices October (E&MJ Quotations)

Copper:	
Electrolytic, domestic refinery	43.030
Electrolytic, export, refinery	43.411
Lead:	
Common, New York	15.500
Common, St. Louis	15.300
Silver and sterling exchange:	
Silver, New York, per oz.	91.794
Silver, London, pence per oz.	79.958
Sterling Exchange, "Checks"	279.205
Zinc:	
Prime Western, East St. Louis	13.000
Prime Western, delivered (g)	13.500
Tin:	
New York Straits	96.090
New York, 99% min. (e)	95.090
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$275.560
Antimony (*E&MJ*) (d)	36.470
Antimony, bulk, Laredo	33.000
Antimony, in cases, Laredo	33.500
Platinum, refined, per oz.	$94.460
Cadmium (a)	170.000
Cadmium (b)	170.000
Cadmium (c)	170.000
Aluminum, 99% plus ingot	24.400
Magnesium, ingot	32.500
Nickel (f)	64.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.
(a) Cadmium average based on the producers' quotations.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lots, packed in case f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.
(g) Delivered where freight exceeds 0.5c.

130,606 tons of primary aluminum was produced in the U. S.; in August 133,551 tons was produced. British Aluminium plans construction of a 100,000-ton plant at Baie Comeau, 200 miles east of Quebec on the St. Lawrence.

Mercury continued to firm up during October. In part this was the result of storms in Mexico, but strong demand contributed.

Tin remained firm throughout October. At the end of the month the strike begun in the middle of the month in Nigeria had not been settled.

Platinum prices continued to rise, reflecting industrial demand and failure of supply to pick-up significantly. The major U. S. refiner raised from the range $91-$94 to $97-$99, effective with business Nov. 1. Dealers were at $104.

"Free" Gold Market

Trade volume grew 40% over September. Transactions in Paris increased sharply reaching the highest level since 1949 with daily dealings in Napoleans at an all-time record. Demand for gold coins grew in every European market and in Canada. South American, Asiatic and African markets were rather active. No rush in gold sales was reported. Pick's World Currency Report quotes on "free gold" per fine oz as follows:

	COINS		BARS (12.5 kg)	
	Sept. 30	Oct. 31	Sept. 30	Oct. 31
NEW YORK, transit	.....	.....	$35.05	$35.05
MANILA	$38.75	$39.00	36.20	36.00
HONG KONG	39.25	40.40	37.85	38.00
BOMBAY	53.50	52.25	53.00	51.75
TANGIER	38.00	38.50	34.98	35.05
BEYROUTH	39.85	40.85	34.13	35.11
PARIS	40.70	41.85	35.90	36.00
BUENOS AIRES	43.00	43.75	39.00	37.80

Note: Prices are computed at the free or black market value of the U. S. dollar in the local markets.

Major Metals

U. S. DAILY AND AVERAGE PRICES

Oct. 1955	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc (f) Delivered	Zinc East St. Louis
1	No Market	44.025	96.500	15.500	15.300	13.500	13.000
3	a3.650	43.250	96.125	15.500	15.300	13.500	13.000
4	43.925	43.325	96.125	15.500	15.300	13.500	13.000
5	43.850	43.475	96.125	15.500	15.300	13.500	13.000
6	43.175	43.350	96.000	15.500	15.300	13.500	13.000
7	43.025	43.125	96.000	15.500	15.300	13.500	13.000
8	No Market	42.750	96.000	15.500	15.300	13.500	13.000
10	43.125	42.975	96.000	15.500	15.300	13.500	13.000
11	42.925	43.025	96.125	15.500	15.300	13.500	13.000
12	Holiday	43.650	Holiday	Holiday	Holiday	Holiday	Holiday
13	42.875	43.600	96.000	15.500	15.300	13.500	13.000
14	42.875	43.275	96.000	15.500	15.300	13.500	13.000
15	No Market	43.325	96.000	15.500	15.300	13.500	13.000
17	43.075	43.725	96.000	15.500	15.300	13.500	13.000
18	43.075	43.000	96.000	15.500	15.300	13.500	13.000
19	42.825	43.225	96.000	15.500	15.300	13.500	13.000
20	43.000	43.450	96.000	15.500	15.300	13.500	13.000
21	42.750	43.400	95.875	15.500	15.300	13.500	13.000
22	No Market	43.400	95.875	15.500	15.300	13.500	13.000
24	42.700	43.325	96.250	15.500	15.300	13.500	13.000
25	42.925	43.275	96.125	15.500	15.300	13.500	13.000
26	42.700	43.300	96.250	15.500	15.300	13.500	13.000
27	42.725	43.825	96.125	15.500	15.300	13.500	13.000
28	42.700	43.575	96.250	15.500	15.300	13.500	13.000
29	No Market	43.575	96.250	15.500	15.300	13.500	13.000
31	42.700	44.450	96.250	15.500	15.300	13.500	13.000
AVERAGES FOR MONTH							
Oct.	43.030	43.411	96.090	15.500	15.300	13.500	13.000
AVERAGES FOR WEEK							
Oct.							
5	43.670	43.888	96.333	15.500	15.300	13.500	13.000
12	43.063	43.146	96.025	15.500	15.300	13.500	13.000
19	42.945	43.358	96.000	15.500	15.300	13.500	13.000
26	42.815	43.358	96.063	15.500	15.300	13.500	13.000
CALENDAR WEEK AVERAGES							
Oct.							
1	43.900	44.838	96.583	15.500	15.300	13.500	13.000
8	43.525	43.213	96.063	15.500	15.300	13.500	13.000
15	42.950	43.308	96.025	15.500	15.300	13.500	13.000
22	42.945	43.367	95.958	15.500	15.300	13.500	13.000
29	42.750	43.479	96.208	15.500	15.300	13.500	13.000

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Oct. 1955	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	(e)	(e)	(e)	(e)	$35.00
3	278.8571	91.875	80.125d.	250s. 10½d.	35.00
4	278.7812	91.875	80.125d.	250s. 10d.	35.00
5	278.7500	91.875	80.125d.	250s. 10d.	35.00
6	278.9285	91.875	80.125d.	250s. 9½d.	35.00
7	279.0000	91.875	80.125d.	250s. 8d.	35.00
8	(e)	(e)	(e)	(e)	35.00
10	279.1250	91.875	80.125d.	250s. 7¾d.	35.00
11	279.1696	92.000	80.125d.	250s. 7d.	35.00
12	Holiday	Holiday	80.250d.	250s. 7¼d.	Holiday
13	279.1770	92.000	80.125d.	250s. 7¼d.	35.00
14	279.0714	92.000	80.125d.	250s. 7¾d.	35.00
15	(e)	(e)	(e)	(e)	35.00
17	279.0312	92.000	80.125d.	250s. 8d.	35.00
18	279.0848	92.000	80.125d.	250s. 7¾d.	35.00
19	279.1741	91.625	80.000d.	250s. 8d.	35.00
20	279.2656	91.625	80.000d.	250s. 7d.	35.00
21	279.3883	91.625	79.750d.	250s. 6d.	35.00
22	(e)	(e)	(e)	(e)	35.00
24	279.4687	91.625	79.750d.	250s. 4½d.	35.00
25	279.4687	91.625	79.750d.	250s. 4¼d.	35.00
26	279.5312	91.625	79.750d.	250s. 4¼d.	35.00
27	279.5000	91.625	79.750d.	250s. 3½d.	35.00
28	279.6785	91.625	79.500d.	250s. 2½d.	35.00
29	(e)	(e)	(e)	(e)	35.00
31	279.6473	91.625	79.500d.	250s. 1d.	35.00
AVERAGES FOR MONTH					
Oct.	279.205	91.794	79.958	—	35.00
AVERAGES FOR WEEK					
Oct.					
5	278.731	91.650	—	—	35.00
12	279.056	91.906	—	—	35.00
19	279.108	91.925	—	—	35.00
26	279.425	91.625	—	—	35.00

Calendar Week Averages: New York Silver: Oct. 1st, 90.975; 8th, 91.875; 15th, 91.969; 22nd, 91.775; 29th, 91.625.
(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c per pound, the average differential for delivery charges.

(b) Our export quotations for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.50c to 1.75c.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily silver quotation reported by Handy & Harman, in cents and fractions of a cent per troy ounce, is the price paid by Handy & Harman in settlement for silver contained in unrefined silver-bearing materials submitted to them for refining. It is determined on the basis of offers of bar silver .999 fine as made to Handy & Harman for nearby delivery at New York by regular suppliers in quantities sufficient to meet daily requirements, and it is usually one quarter cent below the price at which such offers are made.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

London Metal Exchange Quotations

Oct.	COPPER Cash Bid	Cash Asked	3 Mo. Bid	3 Mo. Asked	LEAD Current Month Bid	Current Month Asked	3 Mo. Bid	3 Mo. Asked	ZINC Current Month Bid	Current Month Asked	3 Mo. Bid	3 Mo. Asked	TIN Cash Bid	Cash Asked	3 Mo. Bid	3 Mo. Asked
3	370½	371	366	367	107½	107¾	107¼	107½	91½	91¾	91¼	91½	747½	748	746½	747½
4	364	365	357	358	106½	106¾	106¼	106¾	91	91¼	90¾	91	748	749	746	747
5	363½	364	357	357½	106¾	107	106¾	106½	91	91¾	90¾	91	749	750	747	747½
6	357½	358	351	351½	107	107¼	106½	106¾	90¾	91	90½	90¾	749½	750	746½	747
7	346	347	340	341	106	106¼	105½	105¾	90	90¼	90	90¼	753	754	749	750
10	345	347	339	340	106¼	106½	106	106¼	90	90¼	90	90¼	756	757	748½	749
11	353½	354	344½	345½	106½	106¾	106¼	106½	90	90¼	90¼	90½	760	761	749½	750
12	352½	353	343½	344½	106½	106¾	106¾	106¼	90¼	90¾	90¾	90¾	758	759	749	750
13	353½	354	345½	346	106¾	107	106½	106¾	90¼	90½	90¼	90½	756	757	747½	748
14	346	347	337½	338½	106½	106¾	106¼	106½	90¾	90½	90¾	90½	754½	755	746	747
17	347	348	336	337	107	107¼	106¾	107	90¾	91	90½	90¾	757½	758	746½	747½
18	353	354	340½	341	107¼	107½	107	107¼	91¾	92	91½	91¾	760	761	748	749
19	354	356	342	343	107¼	107½	107	107¼	91½	91¾	91¼	91½	760½	761	747½	748½
20	351	352	339½	340½	106¾	107	106½	106¾	91½	91¾	91	91¼	760	761	749	749½
21	353	355	341	342	107	107½	106¾	107	91	91¼	90½	90¾	761	762	750½	751
24	355½	357	343½	344½	107	107½	106¾	107	91	91¼	90½	90¾	763½	765	751½	752½
25	356½	357	344	344½	107	107¼	106¾	107	90¾	91	90½	90¾	766	767	752½	753
26	357½	358	345½	346	106¾	107	106½	106¾	90½	91	90¼	90½	771½	772½	754	754½
27	357	357½	344	345	106¾	106¾	106¾	106¾	90¾	91	90½	90¾	770	771	754½	755½
28	357½	358	345½	346	106½	106¾	106	106½	90½	90¾	90¼	90½	772	774	755	756
31	370	371	358	359	106¾	106¾	106½	106¾	90¾	91	90¾	90¾	780	781	758	759
Av'g's	£355.893		£346.155		£106.881		£106.589		£90.896		£90.696		£760.167		£750.036	

Prices are for the official a.m. session in pounds sterling per ton. Copper basis wire bars, lead 99.97%, zinc 98% and tin min. 99.75%.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb unless otherwise noted.

MISCELLANEOUS METALS

Oct. 31, 1955

Aluminum ingot, 99 plus % lb			24.4¢
Antimony, spot, lb, less than carload, in cases			36.47¢
In bulk, carload lots, f.o.b. Laredo			33.00¢
Bismuth, ton lots, lb			$2.25
Cadmium, commercial sticks, delivered, lb			$1.70
Calcium, lb, ton lots, 98%, cast			$2.05
Chromium, 97% grade, lb, contract			$1.25
Cobalt, 9 to 99%, per lb			$2.60
Germanium, lb			$295.00
Indium, troy oz			$2.25
Lithium, lb, 98%	$11.00	@	$12.00
Nickel, cathodes, lb, f.o.b. Port Colborne (a)			64½¢
Magnesium, 99.8%, carloads, lb, producer's plants, Freeport, Texas			32½¢
Palladium, troy oz	$22.00	@	$24.00
Platinum (wholesale lots) troy oz	$91.00	@	$102.00
Quicksilver, flask of 76 lb, 25 flasks or more	$278	@	$283
Selenium, 99 plus %, lb	$9.00	@	$10.00
Silicon, minimum 97%, carloads, lb			20½¢
Tellurium, lb			$1.75
Thallium, 100 lb or more, lb			$12.50
Titanium, 99.3 plus, grade A, max. 3% iron, lb			(b)$3.75

(a) Includes U. S. duty. (b) Effective Nov. 1, 1955.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per short ton unit	$36.00	@	$38.00
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:			
44% Cr_2O_3 no ratio	$23.50	@	$24.50
48% Cr_2O_3 3 to 1 ratio	$43.00	@	$53.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:			
Old Range bessemer			$10.40
Mesabi bessemer			$10.25
Mesabi, non-bessemer			$10.10
Lead (Galena), 80%, Joplin, Mo., ton			$195.05
Manganese Ore—Per long ton unit of Mn basis 48% manganese, nearby positions, subject to premiums and penalties 98¢ @ $1 c.i.f. U. S. ports, duty extra. Long-term contract nominal at 94 @ 96¢ c.i.f. duty extra.			
Molybdenum Ore, 90%, per lb of Mo f.o.b. mines			$1.05
Columbium-Tantalum, per lb, combined oxides			(a)
Tungsten Ore, per unit of WO_3:			
Foreign 60%, c.i.f. U. S. ports, duty extra	$33.50	@	$34.00
Domestic, scheelite, 60% f.o.b. mill			$63.00
Vanadium Ore, per lb of contained V_2O_5 f.o.b. mines			31¢
Zinc Ore, Prime, 60% concentrate, Joplin, Mo., per ton			$80.00

(a) Nominal.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb, in bbl carload lots delivered			5½¢
Cobalt Oxide, 72½% to 73½%, ceramic grade, per lb	$1.96	@	$1.97½
Copper Sulphate, 100 lb			$14.90
Germanium Oxide, lb			$142.00
Molybdic trioxide, technical, per lb of Mo	$1.24	@	$1.25

ALLOYS

Ferrochrome 65 to 69%, per lb of Cr. (4–9% C)			26¼¢
Ferromanganese, 74–76%, net ton, seaboard			$190
Ferromolybdenum, 55 to 65% Mo, lb of Mo contained	$1.49	@	$1.57
Ferrosilicon, 50% per lb of Si f.o.b shipping point			11¾¢
Ferrotungsten, 72 to 82%, lb of W contained			$3.45
Ferrovanadium, per lb of V delivered	$3.10	@	$3.40
Silicomanganese, max. 1½% carbon, lb, contracts			11.2¢
Spiegeleisen, per long ton, 19 @ 21% grade			$88.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:			
Crude No. 1	$960	to	$1,500
Crude No. 2	$595	@	$900
Spinning fibers	$321	@	$514
Shingle fibers	$150	@	$200
Paper stock	$109	@	$137
Waste			$77
Shorts	$35	@	$70
Asbestos, f.o.b. Vancouver, B. C. (U. S. funds):			
Spinning fiber, 3-K			$460
Shingle fiber, 4-K			$185
Asbestos, Vermont, f.o.b. Hyde Park:			
Spinning fibers	$279.50	@	$302.00
Shingle stock	$135.00	@	$162.00
Paper stock	$81.50	@	$115.00
Waste, stucco or plaster			$71.40
Refuse or Shorts	$34.00	@	$63.00
Barytes f.o.b. cars:			
Georgia, crude, per ton			$15.00
Missouri, 94% $BaSO_4$, per short ton			$13.25
Bauxite, long ton, f.o.b. point of shipment:			
Domestic crude, 50 to 52% (not dried)	(a)$5.00	@	$5.50
Domestic, chemical, 55 to 58%	(a)$8.50	@	$9.05
Domestic, abrasive, 80 to 84%	(a)$18.00	@	$18.50
Feldspar, bulk ton:			
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50	@	$22.25
Glass feldspar, white, 20 mesh	$11.75	@	$12.50
Fluorspar, f.o.b. mines, bulk, 72½% effective, ton	$33.00	@	$34.00
60% effective CaF_2	$28.00	@	$28.50
Acid 97% concentrate, bulk, ton			$47.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00	@	$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington			$38.00
Mica—Domestic, f.o.b. mines. Punch 12 to 22¢ per lb according to size and quality. Sheet clear, 1½ x 2-inch, 70¢ to 85¢; 2 x 2 inch, $1.10 to $1.60; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap $25 and up.			
Ocher, Georgia, ton, in sacks	$26.50	@	$30.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports			Not quoted
Sulphur, prime, Texas, mines, long ton			$26.50
Talc, f.o.b. works ton			
New York, purified	$18.50	@	$20.00
Vermont, extra white			$13.50
Tripoli, Missouri, ton:			
40-mesh, cream colored			$30.00

(a) Nominal.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces			$58.50
Steel f.o.b. Pittsburgh, billets, net ton			$68.50
Structural shapes, Pa., Ala. etc., 100 lb	$4.50	@	$4.60

Oil Firms Enter Mining; Seek Orebodies and Geologic Talent

MAJOR OIL COMPANIES are planting both feet in all ranges of metal production in the West, and—according to observers—it means more competition for resources for old line firms.

This growing phenomenon was made apparent at a grass-roots level during the fall with announcements:

1. That Gulf Oil Corp. had established field headquarters at Salt Lake City for its wholly-owned subsidiary, Gulf Minerals Corp.

2. That Texas Co. has joined Shattuck-Denn Mining Co. in Shat-Tex Co., aimed at production, refinement and exploration of fissionable metals and other nonferrous materials.

These were but two new developments in a whole series of chain-reactions dating back to earlier moves by Phillips Petroleum Co., El Paso Natural Gas Co., Continental Oil Co. and others among the major oil firms.

Only the Standard Oil companies have, to date, appeared aloof from the probe for minerals other than oil and gas in the Rocky Mountain District. (They are, however, probing oil wildcat holes for uranium.)

One authority says that fully 50% of all petroleum companies in this area are engaged in one manner or another in independent or concomitant search for fissionable materials, rare earths, rare metals, base metals and so forth.

Typical of the oil firms is El Paso's affiliated Rare Metals Corporation of America.

Field director is M. H. Kline, graduate of University of Utah and veteran U. S. Bureau of Mines man. As vice-president and assistant general manager of Rare Metals, Kline has in a short 12 months:

1. Prepared for, bid and won, a 200-tpd uranium concentrator for the AEC's program at Tuba City, Ariz., in the Cameron uranium belt.

2. Placed into production a 175-tpd mercury reduction unit at Weiser, Idaho, calculated to make a handsome profit at Government-purchase levels for quicksilver.

3. Optioned, staked and leased a horde of minerals properties in western, southwestern U. S. and South America. Here the range of interests includes not only uranium, but thorium, columbium-tantalum, nickel-cobalt and base metals.

On latter subject, Kline says: "It's not our main interest, but we're definitely interested."

Gulf Oil Corp.'s minerals affiliate, now in a "cadre stage" with offices at 2021 So. State St. in Salt Lake City, has other ideas.

Stanley E. Jerome, former geologist for New Jersey Zinc Co., who heads the Gulf Minerals Corp., says:

"We are interested in base metals and in rare and precious metals. We are interested in uranium—but we are taking a long look at prospects submitted."

The geologist, who has four mining engineers and geologists on his staff as a "nucleus," said:

"We intend to employ geophysics, geochemistry, geology and guts" in the search for metals in the region. It is a search which he freely admits won't be easy, but one which Gulf intends to keep going as a "continuing" effort.

He said Gulf was aiming at large-sized and modest-sized properties—but also was greatly interested in smaller prospects which have indications of large-scale development.

Out on the Colorado Plateau, the other partner in the Shat-Tex Co., which will seek construction of both uranium concentrating as well as refining plants, is New Jersey Zinc Co.—no more a stranger to uranium than Shattuck-Denn.

Phillips Petroleum Co.'s minerals department office at Salt Lake City has, to date, concentrated on uranium, thorium and non-metallics prospects, such as phosphates and potash.

At present, the actual results of this effort now nearly two years old, has been several uranium drilling deals and acquisition of claims.

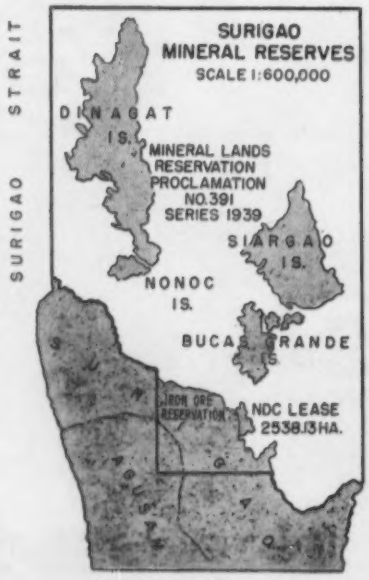
But the company is not uninterested in base metals.

Phillips follows the prescription of all the oil firms now in the metals game—"We'll look at everything, and take a chance on it, if we can make money."

Bids Asked on Surigao Nickel

PRESIDENTIAL TECHNICAL COMMITTEE has opened the Surigao nickeliferous laterite deposits to exploitation by private operators. Any operator, local or foreign, having the organization, finance, resources and technical competence to the satisfaction of the government, may apply for permission to develop, operate and process mineral deposits on the reservation. Proposals may be submitted for development of nickel and secondary iron as well as any other minerals found in the area.

Preference will be given to those operators who will establish a complete organization for mining, processing, smelting and refining nickel and iron in the Philippines.



This is an invitation from Benjamin M. Gozon, committee chairman, for interested parties to submit initial proposals to the government, at this time, before invitations for bids are asked. It is not necessary that initial proposal contain information that the bidder would like to withhold until final bid is submitted.

Surigao mainland reservation is 125,180 acres in size and Nonoc Island is 10,802 acres, for a total iron ore reserve of more than 1-billion tons.

In the exploration of about 504 acres on the mainland, blocked out iron reserves ran to 17-million tons positive and 50-million tons probable; with average 47.76% Fe, 0.75% Ni and 4.09% Cr_2O_3. A previous estimate of 25,000 acres on the mainland is 430-million tons of which 275-million are within easy haul to nearby harbor.

Nickel reserves on Nonoc Island are estimated to be 29-million metric tons in 500 acres of laterite and serpentine averaging 1.38% Ni.

Reservation will be cut into two or more parcels and set up for bids. Preliminary proposals are being received by the Chairman, Presidential Technical Committee on Development of Surigao Reservation, c/o Bureau of Mines, Manila, Philippine Islands.

Technical data available on the area includes: (1) Information Circular No. 6, Notes and Resume of Studies on Surigao Iron Ores, (2) MNS-18, Nickel-Iron Exploration on Nonoc Island, Surigao; (3) USBM Report of Investigations 5129, Preliminary Electric Smelting Research on Philippine Nickeliferous Ores, and (4) MNS-21 Progress Report on Nonoc Island Nickel.

Export-Import Bank Loan For Toquepala Confirmed

TOQUEPALA copper project in Peru received a boost late in September when the Export-Import Bank formally signed a $100-million loan agreement to assist in financing it. Approval of the loan was given in principle last November; this was based on the companies in the project getting another $105-million and the bank indicated they have done so.

Southern Peru Copper Corp., will develop the ore deposit. It will mine about 30,000 tons of ore per day and blister copper output will be about 120,000 tons a year for about 10 years and then will drop to about 90,000 tons. The four companies participating in the project are: American Smelting and Refining, Cerro de Pasco, Newmont Mining Corp. and Phelps Dodge.

Western Mines Inc. Ships First Cerillos Mine Ore

WESTERN DEVELOPMENT CO., Santa Fe, N. M., through its subsidiary, Western Mines Inc., shipped 50 tons of lead-zinc ore from the mining property at Cerillos.

Shipment, received at the AS&R installation at Deming, represents first ore movement from the new property. William E. Scorah, president of the parent firm, which produces natural gas, said the shipment "marks completion of the first phase of an extensive mining rehabilitation program and the reactivation of an important mining area."

IM&CC Will Build Plant To Reclaim Mica From Dam Silt

CONSTRUCTION of a new mica plant at Greeneville, Tenn., has been undertaken by International Minerals and Chemical Corp., according to announcement by Louis M. Ware, president.

Plant will reclaim mica from silt accumulated behind the Davy Crockett Dam in Nolichucky Reservoir. Initial capacity for the plant, expected to be in production in spring 1956, is 100 tpd.

Mining Calendar

World Symposium on Applied Solar Energy, Nov. 1-5, Phoenix, Ariz.

Western Governors Mineral Policies Conference, Sacramento, Nov. 7.

Nuclear Engineering and Science Congress, Dec. 12-16, Cleveland.

Sixth Annual meeting, Governor's Industrial Safety Conference, Mineral Extraction section, Feb. 2-3, 1956, San Francisco.

Institute of Lake Superior Geology, Houghton, Mich., May 11-12, 1956.

(*Mining news continued p 122*)

As we went to press . . .

American Smelting & Refining Co., operating uranium ore-buying stations for the AEC on the Colorado Plateau since 1948, has announced that it will "terminate these activities at the expiration of the present contract on Dec. 31, 1955." AS&R has been operating at Monticello, Marysvale, Moab and White Canyon, Utah; Edgemont, S. D.; Globe, Ariz. and Riverton, Wyo.

AEC has requested proposals from other likely operators to continue the work, with deadline set for Nov. 7. Selection of contractor is expected to be made before Dec. 15. Operator maintains the stations on a cost-plus-fixed-fee contract.

Anaconda Co. stopped receiving uranium ore for the account of the Atomic Energy Commission in late October at its mammoth Bluewater, N. M. plant. Move by the copper-aluminum-uranium concern coincides with completion of a new acid leach refining plant at the site.

Stearns Cook, assistant manager at the plant, explained that the company's contract with AEC expired with completion of the new plant and said the Anaconda mines, particularly the huge Jackpile, will take up most of the refinery capacity. Production of uranium concentrate, said Cook, will go up. He also indicated that an ore-buying station may be set up in the area to handle those mines which previously shipped to Bluewater.

"If we feel there's sufficient ore and water available" for a mill in the Elk Mountain district of San Juan County, Utah, "we will ask the AEC to open negotiations," says William B. Hall, general manager of Vitro Corp. of America. Vitro signed an agreement with Shumway Uranium Co., Blanding, Utah to investigate the project.

Monazite lode deposit in northwestern Saskatchewan has been optioned by Lindsay Chemical Co., major thorium producer. Option covers 18 claims in the Lake Athabaska mining district near Uranium City. Geological surveys made by Lindsay this past summer opened up a vein averaging 12 ft and assaying an average of 15% monazite. Thorium content of the unconcentrated ore averages a little over 1% thorium oxide. (See page 75, this issue.)

Vanadium Corp. of America had decided to put its Peruvian mill on standby—with full consent of the Peruvian Mining Department. A resident mining staff is continuing exploration and development of the mine.

Reason for curtailment, according to company spokesmen, is that production of uranium and vanadium on the Colorado Plateau has been stepped up by VCA, where the firm has found it more economical to mill ore. Should demand warrant it, says VCA, Peruvian production will resume.

Guy and Vance Thornburg, Colorado Plateau operators, have leased Oregon's Lucky Lass and White King uranium discovery prospects. The brothers indicated that the prospect would be incorporated under the name Lakeview Mining Co.

Behind the By-Lines . . .

G. P. Lutjen

Thorium is probably named after Thor, Norse god of thunder, and as far as we know, this is about the only question on the subject that Jim Franklin and Mike Eigo haven't covered in their report starting on p 75. We must confess at the outset that the entire thorium situation abounds in confusion but the success of the September report on Lithium has made us foolhardy. We have tried, with thorium, to go beyond the faithful reporting of the confusion to give you a clear picture of the situation as it exists today. And if you have some friends who are at sea on the thorium question, reprints of the whole article will be available. Just write to: Reprint Editor, 330 W. 42nd St., New York 36, N. Y.

Vichysoisse. Why?

You can call this the "Three Kids" issue if you want to. The only problem that remains is whether you mean the Three Kids manganese operation whose fantastic doings are reported on p 88 or the three kids whose operations in California are reported on p 97. Either way, we think you're in for some interesting reading.

At Henderson, you'll find the details of how to handle a low-grade manganese ore and make money, a challenge that has previously lured a good many mining people into the bog of frustration.

In California, you'll learn how a few teen age boys got a flying jump at private enterprise in a tungsten mining operation. These boys, all under the age of sixteen, are drilling, blasting and loading their own ore. In an era of accelerated juvenile delinquency we feel that these California boys deserve any Junior Achievement Awards, Merit Badges or Oak Leaf Clusters you may have available for presentation.

If the expense accounts of your company representatives who attended the Las Vegas meeting of the Mining Congress are a little weightier than usual, remember that "the quality of mercy is not strained—it droppeth as the gentle rain" etc. The boys may have droppethed a bob or two at the tables but by and large it was probably the most creditable convention ever held in the Land of Chance. Technical sessions, despite outside attractions, were well attended and from all reports the Las Vegas citizenry was impressed by the decorum of the meeting. In case you couldn't be there, a full report on the sessions is available starting at p 100. We only regret that space doesn't permit the operation of a roulette game to give you the full flavor of the get-together.

House organs of the mining industry have long since replaced the Rover Boys as our standard reading material. Publications of the mining companies rank among the best jobs being done and among the best of these is the *Moly Mountain News,* issued by the Climax Molybdenum people at Climax. One of the outstanding features of that publication has been the cartoons of an artist whose drawings are merely signed "phyl." On this page is a cartoon by "phyl."

Overwhelmed by curiosity, we contacted the Climax people to learn more about phyl. Turns out that she is the wife of Gorden Weller who was, until the time of our inquiry, public relations director for the company at Climax. He is now advertising manager of the company with offices in New York and so presumably phyl's cartoons from now on, wherever they may appear, will be concerned with the problems of traveling on the subway, getting lost in Grant's tomb or locating the "oldest continuous permanent floating crap game in New York."

There is a new parlor game afoot, according to the *Saturday Review.* It will probably never replace "Post Office" and other national pastimes but it has possibilities. It consists of making a statement after which nothing else can possibly be said. Outstanding example on record to date is the following: "My grandfather had a wealth of funny stories but he never told any of them."

Try that on your Tuesday night bridge club.

Bothered by one of those guys who's always bragging about what a hotshot he is when it comes to grammar or spelling? If so, we have here a packaged counter attack. Just ask him to write the following sentence.

"Beside a cemetery near the seminary sat an embarrassed peddler and a harassed cobbler, gnawing on a desiccated potato and gazing at the symmetry of a lady's ankle with unparalleled ecstasy."

When a college professor dictated that to 208 students not one got it right and the average was 5 mistakes. If any of your colleagues can get through it without an error, let us know. We may have a job for him.

Thorium

Where should you look?
Who'll buy it?
How is it refined?
What is the outlook?

James W. Franklin, assistant editor
Daniel P. Eigo, news editor.

PLACING THORIUM IN PERSPECTIVE today involves study of its history since 1946 and beyond and demands interviews with top industry and Government figures. In order to locate the middle ground between those who see it as a competitor of uranium tomorrow and those who discount its ever becoming more than a rare earths by-product, it was necessary to contact thorium people all over the world.

Speeches by Government and uranium leaders over the years; papers presented at Geneva which established world interest; announced embargoes on thorium-ore shipments by foreign administrations; all approached the question without ever giving the complete picture.

AEC has been buying by-product thorium (in excess of licensed domestic and export sales) for research and development and for stockpile. Presently established stockpile goals are "reasonably assured of fulfillment." Consequently, no new contracts are being negotiated.

Shipments and sales are subject to Commission's licensing regulations. No ore-buying program similar to that for uranium has ever been set up. Commission notes that thorium is a source material under the Act of 1946 and has "potential use."

It "may possibly be converted into a satisfactory fuel for the production of industrial power. When and to what extent these uses may become important will be dependent upon the results of research and development programs."

In the "breeder" reactor, where more energy is created than destroyed in the process, uranium 233 is derived from thorium much the same way in which plutonium is derived from uranium. (See page 80 for a description of the breeder reaction.)

In non-energy uses, however, thorium has only shown real vitality in recent history during World War II and Korea. Its major use in industry is still in the manufacture of gas mantles for incandescent lamps—not a field which anticipates volume growth in the second half of the 20th century.

In metallurgy, chemistry and medicine, coupled with nuclear growth, thorium has the promise of a good future, both in direct use and in demand for its companion elements in monazite and other rare earth deposits. (Expanded use of the latter will encourage volume production of thorium.)

Still, most industry observers forecast a long haul before volume production will be possible and profitable. Of thorium's companions in monazite, only cerium and mixed oxides are important compounds today.

Financial assistance by DMEA is available for thorium exploration and development and, according to Charles O. Mittendorf, administrator of the Defense Minerals Exploration Administration, "it is expected to remain on the list."

Of twelve applications in which thorium was named as the primary commodity, Mr. Mittendorf observes that four have resulted in contracts with a total value of $117,006 and Government participation of $105,-301. Two of the four have been terminated, with one certified as a discovery or development. Three applications are being processed to completion at this time.

The DMEA administrator also notes that thorium often appears as a secondary commodity in many of the rare earths and uranium applications received by his agency.

ODM has no stockpiles of thorium or thorium compounds and ore, according to C. F. Ogden, assistant director for materials for the Office of Defense Mobilization. "Although years ago some monazite which contained thorium was included in the rare earths stockpile to provide for an additional supply of rare earths when the latter material was critically short."

Says Ogden, "An expansion goal for thorium has never been established; hence, certificates of necessity as an incentive to increase production have not been issued."

Canada does not purchase thorium ores, nor does it provide for thorium content in uranium ores purchased, according to R. J. Henry, vice president in charge of operations, Eldorado Mining & Refining, Ltd.

The Atomic Energy Control Board regulates development of all radioactive minerals, including thorium, and controls disposal "of any important quantities which may be produced." Permits are required to drill, test pit and ship large bulk samples for test.

United Kingdom tried to implement production in 1949 by guaranteeing a price of £50 per long ton of monazite (95% rare earths plus thorium) until 1959.

Producers said then (and still say) that the price was too low and production costs too high for the guarantee to be effective.

Australia controls exports of thorium-bearing materials and so far has only permitted shipments to the U.K. and U.S. The same rulings apply in the Union of South Africa. India has continued the ban established by the Maharajah of Travancore in 1948, which prohibits export of thorium-bearing material. Present government of India has built a mill to extract thorium for stockpiling and permit shipping of rare earths overseas.

Brazilian law prohibits the export, in any form, of thorium as well as its compounds and ores; except on a Government - to - Government basis. Non-thorium rare earths may be exported by private companies without coming under the regulation. Colombia also regulates mining and sales.

The following six pages contain a description of the geology and mineralogy of thorium; discussion of the milling and refining procedures; available production statistics (where such publication does not violate security); and some hints on the future.

Monazite Placers—Major Source

PRINCIPAL RAW MATERIAL sources for thorium, as far as major U. S. producers are concerned, are the monazite placers of Brazil and India and the high-grade hydrothermal deposit in the Union of South Africa.

Tin and gold placers, while containing extensive and high-grade monazite, are not being worked for even secondary recovery of the thorium-bearing minerals in many parts of the world. Most producers seem to agree that the high costs involved in changing the flowsheet and recovering the monazite are prohibitive at today's low value.

U. S. placer operators face an uneconomic condition even when considerable amounts of rutile, ilmenite, gold and zircon are present; in the case of gold because the monazite is of such a low grade, and in the others because it is rarely possible, in today's market, to show a profit on secondary recovery.

Thorium, like uranium, originated in igneous rocks and has a marked affinity for alkaline rather than granitic or intermediate rocks through magmatic differentiation. It originated in pegmatites, particularly nepthelinesyenites; it exists in hydrothermal veins, gneiss, schist, metamorphic rocks and placer deposits, both young detrital residues and old Precambrian quartzite, grit and conglomerate where the rock is hard, brittle, compact and in some cases recrystallized.

No important deposits of thorium-bearing mineral have been reported found in sedimentary rock, nor had vein thorium ever been found comparable in grade or size to pitchblende deposits until recently. Thorium's refractory mineral nature is responsible for the additional fact that no commercial deposits of supergene origin are known today.

Although thorium and uranium originate in similar rock, they are rarely found together in mineable quantities. Thorium primary minerals are quite oxyphilic, chemically stable and very refractory. Thorium exists in insoluble tetravalent state in all mineral forms.

During weathering of original host rock, uranium (IV) altered to uranium (VI), which is highly soluble and easily leached out of the host rock. At the same time, very insoluble thorium minerals remained behind. As weathering and erosion continued, thorium was concentrated in detrital residues or placers. Thorium minerals tend to concentrate in placers with gold, tin, tungsten, diamond, magnetite, ilmenite, rutile and garnet. They are also found with columbium-tantalum. Hardness, high specific gravity and insolubility have made placer deposition possible.

Largest commercial desposits of thorium are monazite bearing placers. Sand in placers is usually black if magnetite or ilmenite predominate; red if garnet.

In pegmatites, thorium is found with feldspar or with apatite and may be recovered as by-product during mining for major constituent.

In hydrothermal veins it is found as thorite or thorogummite with calcite, dolomite, quartz and apatite.

About three times as abundant as uranium, thorium is present in over 100 known minerals in the earth's crust and has an overall content of about 12 grams per ton of crust. All thorium minerals are radioactive and accumulate lead and helium.

Thorium shows an affinity toward rare earths, zirconium, hafnium, and uranium minerals, oxides, silicates, phosphates, carbonates and fluorides; and a decided antipathy for hydrous minerals.

Placers are Vast

Largest placers are in: Bahia, Rio de Janeiro and Espirito Santo, Brazil; Travancore, India; Ceylon, (concentrates average 8% ThO_2); Indonesia; Malaya and Queensland, Australia, (concentrates average 3-9% ThO_2). Reserves of these extensive deposits are quite large, but some producers admit they would rather have one good deposit of thorite or thoranite.

Travancore and Madras manazite runs 0.2-0.46% U_3O_8 and 5-11% ThO_2 in sands holding other heavy minerals. Total reserves in Travancore-Cochin area are estimated to be 150,000 to 180,000 tons of ThO_2. Other scattered beaches hold additional tonnage. Concentrates run 5-10% ThO_2.

Tin deposits in Thailand yield some monazite, 40-60 mesh in size and 5.7% ThO_2, but the assorted heavy minerals render effective and efficient separation difficult.

Tin placers in Nigeria could yield monazite and thorite if producers found it worth while to do so. Reserves of submarginal ThO_2 are in excess of 2,000 tons.

Ten placers in Malaya contain more ThO_2 than all the deposits in Nigeria, but the thorium is all in monazite, which is not being recovered to any great extent.

Taiwan placers are estimated to hold 280,000 metric tons of monazite. It is present in Japan in tin placers.

Gold bearing placers in Korea have been worked for over 50 years and no attempt has been made to recover monazite.

In Western Australia, monazite is associated with cassiterite in placers. In New England region of New South Wales it is found with tin and tungsten. Concentrates run 5% ThO_2.

From Bruce Bay to Hokitika, New Zealand, uranothorite (62.6% ThO_2 and 11.9% U_3O_8) is found. On Grey River 4.9% ThO_2 monazite can be found. Port Pegasus has monazite.

Brazil has beach deposits between Cape Frio and Recife; Bahia, Rio de Janeiro and Espirito Santo districts; Comoxatiba, Guarapary and Macahe are richest. Monazite is found in diamond washings on Pardo River and also near Bom Jesus dos Meriras, in gold placers in Rio Parahyba do Sul and near Santa Isabel de Rio, Preta district. Concentrates contain 6% ThO_2. Reserves are estimated to be 70,000 tons of 6% ThO_2 monazite.

Placers in British Columbia and Yukon contain allanite and monazite.

Along the Nile in Egypt, some monazite has been mined.

It is found in the gold placers on the Sanarka River in the Ural Mountains, Russia and thorianite is known to be present in gold placers near Transbackalia, Siberia.

Placers found in U. S. include: Harley area, Blaine County, Idaho, where concentrates running 3.5 to 5% ThO_2 monazite have been produced by three companies; Wausau, Wis., where thorogummite and other thorium minerals can be found in the soil, which runs up to 1% ThO_2; Peidmont district of the Carolinas, where monazite concentrates with up to 6% ThO_2 have been made; Florida, where monazite is recovered as by-product at Jacksonville, but not at nearby Starke; and Georgia and Alabama, where xenotime has been found.

U. S. placers are associated with

gold, zircon, magnetite, rutile, ilmenite and garnet; but within the last few years, foreign monazite has drastically curtailed domestic production in Idaho, the Carolinas and Florida.

Low grade conglomerates (8 to 30 lb monazite per ton) are found in Big Horn Mountains, Wyo. in basal part of Deadwood formation (Cambrian). Near Palmer, Mich., up to 54 lb per ton and 110 lb per ton on old mine dumps make this area a potential thorium producer.

Largest known monazite conglomerate in Canada is the well-known Blind River deposit.

Many deposits are being found in environments previously believed to be unfavorable. Abundance of certain critical elements, such as fluorine in ground water, are useful in determining thorium potential of an area as are geiger counters and scintillometers.

Pegmatites are Low Grade

Important future sources of thorite in feldspathic pegmatites are known to exist on Kola Peninsula, Russia; in southern Greenland; in Langesund area near Oslo, Norway. Although the nepheline-syenite deposit near Oslo has yielded a yellow thorite (called orangite) and monazite, it is not considered a large scale source.

Neighboring Sweden has no pegmatites worth working for thorium, but central Sweden Pb-Zn deposits contain thucholite, which may eventually become economic.

Elsewhere, pegmatites known to contain thorium exist in Travancore, in Ceylon where they were once worked for thorianite and in Brazil on the edge of the shield (monazite).

Migmatites in Southern Rhodesia-South Africa border are widely mineralized with thorite, allanite and euxenite. Allanite is also present in low grade deposits of New Zealand.

In Russia near Miask, in France near Bourg d'Oisians and at various places in Canada (including the Bancroft area) pegmatites containing thorium are known. Monazite is found at Villaneuve, Quebec while uranothorite is found near Parry Sound, Ontario and in Saguenay district of Quebec.

U. S. has extensive but low grade deposits, in Worcester County, Mass. (0.03% ThO_2 estimated); Deer Creek and Beaverlodge County, Mont.; and St. Peter's Dome, El Paso County, Colo. From east central Virginia to Alabama, 600 miles away, bed rock containing estimated 8 lb monazite per cu yd is known.

Thorium-bearing igneous and metamorphic rock can be found in Idaho, Montana, South Carolina, South Dakota and California; but all are low grade.

A Rich Hydrothermal Vein

Largest and best known hydrothermal deposit is in Van Rhynsdorp, South Africa. Deposit runs 70% monazite and 5% copper, making it very competitive with U. S. producers, even though ThO_2 content is reported to be 1% to 2%.

Intrusive carbonate masses in central and east Africa are rich in apatite, thorium phosphate and monazite. Best known, but not workable, are those in Rhodesia and Nyasaland. Those in Kenya, Uganda and Tanganyika have good potential.

If pyrochlore deposits of Kaffo, Northern Nigeria could be worked for columbium-tantalum, the thorium and uranium might be recovered as by-product. But such ores are quite refractory.

Monazite in Nkumbwa Hills near Isoka, Northern Rhodesia is devoid of thorium and placers in same area are submarginal for rare earth monazite.

No thorium deposits of any kind have been reported in Austria and British Isles.

In Powderhorn district, Gunnison County, Colo. more than 33 veins (a few inches to 18 ft wide and up to 3500 ft long) are known. In an area 6 miles wide and 20 miles long, veins carry thorite and thorogummite with calcite, dolomite, quartz, cerium fluorapatite and bastnaesite. Iron Hill is notably rich in rare earths but not thorium.

Large areas in Wet Mountains, Custer and Fremont Counties, Colo. contain thorite-like mineral in albite-syenite intrusions. Over 350 veins, 5 to 50 ft wide and up to 5,000 ft long, have been located. Veins run about 0.1% ThO_2.

Elsewhere veins are known at Salmon Bay, Prince of Wales Island; Alaska; Mountain Pass, San Bernardino County, Calif. (0.5% ThO_2); Gallinas Mountains, New Mexico and Bastnaes, Sweden (both low in thorium, but high in rare earth); Bear Lodge Mountains, Wyo. (less than 0.25% ThO_2) and thorogummite veins in central Wisconsin, Colorado and California.

At Lemhi County, Idaho (1.2% ThO_2) veins of massive monazite are known, also in Montana, Indiana, and Mountain Pass, Calif.

Major Thorium Minerals

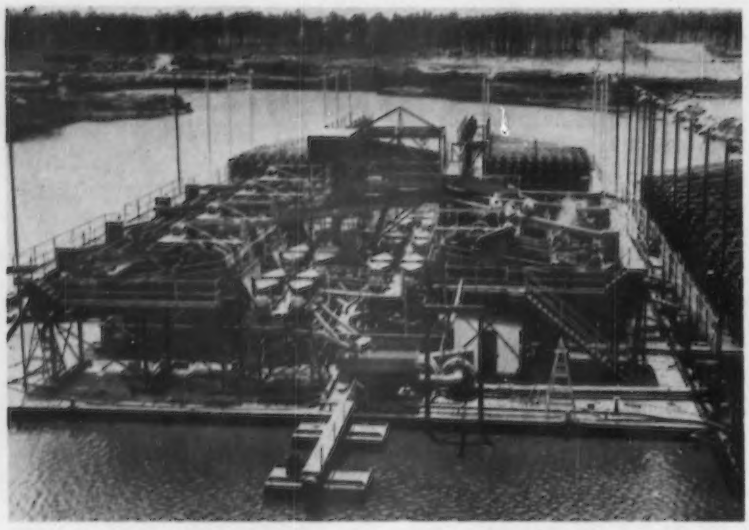
Thorite, $ThSiO_4$, is 25-63% ThO_2 and up to 10% U_3O_8. Highly desirable but very rare. Found with fluorides in pegmatites and hydrothermal veins. Square prisms with pyramidal ends or massive. Hardness 4.5-5. Specific gravity 4.5-5.4. Color ranges from orange-yellow to black. Streak light orange to dark brown. Fracture conchoidal. Glassy when fresh, greasy when altered.

Monazite, a cerium-thorium-rare earth phosphate, is up to 15% ThO_2 and 1% U_3O_8. Common in placers, but not desirable when thorium is goal. Found in pegmatites, veins and placers. Monoclinic small crystals with faces often striated or uneven. Hardness 5.5. Sp. gr. 4.9-5.3. Index refraction 1.786-1.837. Color is reddish brown to yellow. Streak white. Resinous. Cleavage basal perfect. Fracture conchoidal. Translucent to opaque. Brittle.

Uranothorite, silicate of thorium and uranium with up to 63% ThO_2 and 12% U_3O_8. Rare, but found in placers. Prismatic crystals. Specific gravity 6.7. Color ranges from dirty brown to olive-yellow. Translucent to opaque. Fracture conchoidal.

Thorianite, ThO_2, contains up to 70% ThO_2 with small amounts of rare earths. Rare. Sometimes has bronze tarnish. Streak black or gray. Fracture uneven to conchoidal. Soluble in H_2SO_4.

Thorogummite, $Th(SiO_4)_{1-x}(OH)_{4x}$, is a weathering product of other thorium minerals. Rare. Contains up to 58% ThO_2 and 31% U_3O_8.



USING FLOATING CONCENTRATORS and mining by hydraulic dredge, Humphreys Gold Corp. is recovering by-product monazite from titanium beach sands.

Ore Specifications And Prices*

MONAZITE TYPE ORE: Minimum rare earth plus ThO_2 content—55 to 60%. Generally worth $300 per short ton f.o.b. in carloads, West Chicago, Ill. Per lb c.i.f. U. S. ports, 55% total rare earths, including thorium, massive, 13c. Sand 55% grade 18c; 66%, 20c and 68%, 22c.

THORITE TYPE ORE: No established schedule, but has a value of about $1 per pound contained ThO_2, for concentrates of at least 10% ThO_2, f.o.b. Colorado, in carload lots.

How Processing Takes the Hurdles

IT IS DIFFICULT, says L. W. Davis, president of Metal Hydrides, Inc., Beverly, Mass., "for one company by itself to develop the processes from ore extraction through to fabrication of finished metal due to the complex and expensive chemical and metallurgical processes involved in each step.

"The type of assistance the industry needs," Mr. Davis continues, "is a mutual understanding and confidence between a number of organizations that are staffed and equipped to handle various phases such as mining . . . chemical processes for extraction and concentration . . . metallurgical processes of refining and fabrication.

"This latter stage necessarily involves the application of the new techniques of powder metallurgy, vacuum melting and casting."

Metal Hydrides and Westinghouse Corp. have produced small quantities of metallic thorium since 1935, purchasing the raw material from other producers.

Lindsay Chemical Co., West Chicago, is one of the oldest and is the biggest producer of thorium compounds in the U. S. Lindsay Chemical, according to president Charles R. Lindsay III, is processing monazite at the present time and prefers that raw material because of its vast experience with its benefits and pitfalls. The Illinois firm is not refining any thorite concentrates right now. Mr. Lindsay sees the outlook of thorium governed by its adaptation in the atomic energy field.

Maywood Chemical Works, another oldtimer in the field, has refined thorium-bearing ores since the early 1900's and mined from that time up to the decline of the gas mantle era. Maywood, which prefers thorite-type material, is refining concentrates today.

Some Old Some New

Foote Mineral Co. formed a Brazilian subsidiary following World War II, which mined extensive deposits of monazite-rutile-zircon-ilmenite and beneficiated them as well, according to Gordon H. Chambers, president. The property was sold to Lindsay in 1949. Foote is not refining thorium concentrates at this time and would only be interested in ore purchases if assured of a "continuing and competitive domestic supply."

Davison Chemical division of W. R. Grace & Co. and Rares Earths, Inc., a Grace subsidiary, are coming into the picture on a 10,000 ton per year rare earth and thorium basis.

Joint research program is underway on production and end uses.

Mallinckrodt Chemical Works is not in the picture at this time.

Crane Co. anticipates production of 1,500 to 2,000 tons per year monazite from its subsidiary, Marine Minerals, Inc., which will produce rutile, ilmenite and zircon as well. Crane is not now refining concentrates and E. E. Wyatt, executive assistant, states the company opinion that "thorium concentrates should have not less than 5% contained ThO_2."

Joining Crane Co. in the Marine Minerals project, Societe de Produits Chemique des Terres Rares will have an assured monazite supply for their 2,000 ton per year plant. Societe has produced quantities of thorium and rare earths at their Paris refinery for over 30 years.

Reluctantly, Societe provided the technical assistance in the erection of Sao Paulo, Brazil and Travancore, India refineries, after it was determined that the programs of Brazil and India were inevitable.

Thorium Ltd., in England, declined comment due to U. K. regulations.

Baumhoff-Marshall, Inc., is dredging rare earth sands in Idaho (see *E&MJ*, March 1954, p 190) and Humphreys Gold Corp. is dredging monazite beach sands in Florida.

Other producers of thorium and rare earth compounds include: Trei-

* *E&MJ Metal & Mineral Markets* sources. Prices are subject to negotiations. Quantity, quality and producer's refining cost will determine final price paid to miner. License to sell thorium compounds must be obtained from the AEC, Licensing Branch, 1901 Constitution Ave., Washington 25, D. C.

bacher Chemische Works, Treibach, Germany; Oriquima do Brasil, São Paulo; Indian Rare Earths Ltd., Alwaye, Travancore, India.

From placer to end use, producers face a continuing series of deficiencies and problems such as lack of high grade domestic deposits, low thorium content and monazite, lack of better minerals in large quantities, refractory nature of monazite, large amounts of rare earths recovered in the process of reclaiming the thorium, and lack of market for accessory minerals recovered with monazite concentrate.

These additional problems face the producer and the miner: radioactive hazards involved in handling thorium ores, compounds and metal; explosive nature of fine metal particles; lack of guaranteed and satisfactory price for thorium and rare earths; lack of a mining industry large enough to handle wartime non-energy monazite demands or even a peacetime large-scale energy program; and finally, cost and quality competition from foreign concentrates.

Monazite is Refractory

Monazite mining is usually by dredge or dragline. Some of the concentration process is already performed on ocean beaches by wind and wave. Further concentration with jigs, tables, sluices or spirals yields a concentrate of "heavies," containing monazite, other thorium minerals, magnetite, ilmenite, rutile, zircon, garnet, staurolite, gold, tin, cassiterite, platinum, kyanite, columbite-tantalite, euxenite and samarskite.

Heavies are separated partially from each other on wet magnets; dried, passed over dry magnetic separators and electrostatic separators to complete the separation. Recovery of monazite is about 80%. In India, finished concentrates 99% monazite are common. In Idaho, lack of market for accessory heavies has hampered production even during the period when imports of thorium were small. At Humphreys Gold Corp. plant near Jacksonville, Fla., monazite is recovered, but at Starke it is discarded.

Either acid or caustic digestion can be used to put thorium in solution. Little economic difference is found in either process. Acid method uses sulphuric on fine ground concentrates to decompose; but if uranium is being recovered, sulphate ion is undesirable as it decreases extraction of thorium and uranium. In this case caustic digestion must be used or nitric acid must be added to the sulphuric to offset sulphate ion.

Reprints of this survey may be purchased from the Reprint Department, *Engineering & Mining Journal*, 330 W. 42nd St., New York 36, N. Y.

After digestion, acid is decanted and filtered from unreacted sand. Settling removes suspended solids — mainly silica, thoron, radium and thorium daughter products. Diluting filtrate and adjusting pH to 1.0 with ammonium hydroxide precipitates 99% of the thorium along with about 5% of dissolved rare earths. Thorium comes down as phosphate and rare earths as sulphate. Precipitate is allowed to settle, then decanted and filtered. If purification ends here, concentrate must be fused with soda ash to convert thorium phosphate to ThO_2.

When a much purer product is desired, precipitate is dissolved in nitric acid and extracted with tributyl phosphate. Evaporation of solvent leaves a finished product containing only a few parts per million rare earths.

Filtrate from hydroxide precipitation step is raised to pH 6, where remaining rare earths and uranium come down. Precipitate is collected and dissolved in nitric acid. Solvent extraction recovers uranium and evaporation of acid yields rare earths. Brazilian variation of this method was described in *E&MJ*, October 1955, p. 77.

Caustic digestion with sodium hydroxide takes 3 hours at 140 deg C with moderate agitation. Sand must be 99% minus 325 mesh. Slurry is diluted with wash water from a later step and digested for one more hour to aid filtration. Hydrous oxides are decanted from sand and filtered at 80 deg C under 60 psig pressure.

Hydrous oxides are dissolved in concentrated HCl at 80 deg C, diluted and neutralized to pH 5.8 with caustic. All the thorium and uranium precipitate along with about 3% of the rare earths. Thorium and uranium are recovered by selective solvent extraction as mentioned above. Rare earths are recovered from the neutral oxides.

Three For the Metal

Metal can be produced by fused halide electrolysis, by thermal decomposition of halides or by thermal decomposition of the oxide. Electrolysis has been abandoned by U. S. industry. Thermal reduction employs a metal or metal hydride such as sodium, calcium or magnesium. Although magnesium has certain advantages, calcium is used in most processes described.

Westinghouse uses calcium reduction and Metal Hydrides, Inc., prefers calcium hydride reduction of the oxide. AEC uses calcium reduction of thorium tetrafluoride and has produced several tons by this method.

Charge containing tetrafluoride, calcium metal and anhydrous zinc chloride (to produce a low melting alloy and act as thermal booster) is placed in a steel bomb and heated in furnace to start the reaction. Reaction is exothermic. Molten metal and slag separate and as reaction slows down the mass solidifies. Slug is removed from the bomb, slag cut off and residual zinc removed by vacuum distillation. Metal is remelted in a beryllia crucible and poured into a mold.

Metal can be made from oxide with calcium metal (or the hydride) and calcium chloride. Charge, in steel bomb, is heated to 950 deg C for one hour. When cool, mass is leached with dilute nitric acid (1:10), then washed in succession with water, alcohol and ether. Process yields a metal powder that is vacuum dried, compacted under 10-15 tons per sq in. pressure, and sintered for 30 minutes at 1300-1450 deg C. Sintering results in solid ductile metal, 99.7% pure.

By the Ames Process

When ultrafine metal is required it can be obtained from the Ames process, which has been turned over to National Lead Co. of Ohio. Using 99.7% thorium metal, process involves vacuum purification at 510 deg C for 24 hours, cooling to 260 deg C, addition of iodine to form thorium tetraiodide, heating iodide to sublimation point (485 deg C), and decomposing iodide on an electrically activated pure thorium filament at 1750 deg C. Product is 99.97% pure thorium metal.

Metal can be machined if precautions are taken to prevent chip or dust explosions and if machine operators are protected from possibility of ingesting deadly radioactive thorium metal particles.

Although old hands in the industry discount the deadly effects of thorium, thoron, radium and daughter products, U. S. released a paper at Geneva covering the effects of these materials. Paper warned that careful monitoring of all process equipment, buildings and personnel should be practiced.

If radioactive material enters the body, thorium-type particles enter the liver, kidneys, spleen and bone marrow, while radium-type material collects in the bone. Body then receives radioactive bombardment in both tissue and bone. So far as is known, no fatalities have occurred in the industry to date.

For Progress—New Avenues Needed

MONAZITE MINING AND PROCESSING today is substantially a rare earths industry. Rare earths in the ore have increased in use as thorium has declined. If the industry processed monazite for thorium only, about 200 tons of 6% monazite would be needed each year for non-energy end use. But, at the present time over 3,000 tons of monazite are being imported to satisfy domestic rare earth requirements. Surplus thorium in these 3,000 tons is being sold overseas, stockpiled at the refinery or sold to the Government.

Biggest factor in the steady drop in use of thorium in non-energy applications has been the ever-decreasing application in incandescent gas mantles and gasoline lanterns. Authorized non-energy uses in 1950 consumed 48,171 lb; in 1954, 9,765 lb ThO_2. Still, according to Howard E. Kremers, director of research, Lindsay Chemical Co., "The largest single use of thorium materials today is in the manufacture of gas mantles."

Other uses of thorium in non-energy fields in order of importance are: magnesium alloys, where Th contributes high temperature resistance under supersonic conditions; as a catalyst in chemical and medical applications and as an ingredient in medicines and dental powders; in electronics, tubes and filaments, and in special glasses for sun lamps.

Of thorium's 15 companions in monazite, only cerium, the mixed oxides and misch metal find large-scale application today. Nine of the 15 have no commercial use so far, but USBM is spending $250,000 in 1955 to find applications for them. USBM apparently considers the program necessary to make use of the surplus of rare earths which will accumulate in connection with an energy program.

Thorium to Uranium

Thorium metal is being processed by National Lead Co. of Ohio for the AEC. Metal is refined by the Ames process and is being used in experimental work on the "breeder reaction", where thorium is converted into uranium and more neutrons are produced than are consumed in the reaction.

Natural isotope 232 is not fissionable, but when it is bombarded by slow neutrons it is transformed into Th 233, which degrades through protactinium 233 to uranium 233, a fissionable element. This is the breeder reaction. Not all thorium in nature is Th 232; some exists at Th 228 and daughter products, which are not usable in this reaction. Transformation is independent of the chemical state, but maximum effect is obtained with the metal.

Major unsolved problem is production of low-cost thorium metal for the breeder reaction. It is reported that as little as five parts per million gadolinium in pure thorium metal will absorb enough neutrons to stop the breeder reaction. Efforts to produce breeder metal might raise the cost from the present $20-$30 per lb figure to more than $100.

K. E. B. Jay makes the following remarks about the breeder reaction in newly published *Atomic Energy Research at Harwell:*

"This process . . . called breeding . . . effectively multiplies the world's reserves of energy producing fuel by a large factor . . . (breeding) produces more fuel than it burns . . . it must be emphasized that this does not mean something for nothing or that the process can lead to free electricity.

"The fissile material must be freed from the fertile material by chemical means . . . reprocessed several times before all the original fissile atoms have been burnt. Each chemical treatment costs money . . . breeding does not promise free electricity."

In addition, Mr. Jay points out that further bombardment of U-233, produced from Th-232, will yield U-234 and even U-235.

Building Breeders

AEC reports that a concept being studied at Brookhaven National Laboratory is "a reactor with uranium solution in molten bismuth as fuel and with a blanket of thorium in molten bismuth surrounding the fuel."

Development program for homogeneous reactors (HRE2) includes investigation of uranium and thorium systems, with "major effort directed toward a two-region thorium system believed capable of producing lower cost nuclear power." HRE2 has been scaled up to 10,000 kw.

HRE2 had originally been planned at 3,000 kw, but with the modification to 10,000 AEC believes construction of a 65,000 intermediate-sized reactor, planned previously, will now be "unnecessary".

Three breeders are now in the works:

Consolidated Edison of New York has applied for license to build a $55-million, 250,000-kw heat plant.

Foster Wheeler Corp. has designs for 100,000-kw unit.

Babcock & Wilcox has contracted to build the Brookhaven National Laboratory-designed reactor.

Heat output of the reactors will be converted into electrical energy at up to 25% efficiency. Operating data will be available by 1960, so any cost per kw is speculative at this time.

A 250,000-kw reactor will need about 42,000 lb thorium in first year and half that much each succeeding year. More than 466 tons of 6% ThO_2 monazite will have to be processed to produce metal for first year.

Production Is Classified

Atomic Energy Acts of U. S., U. K., Brazil, India, Canada and Union of South Africa control the mining, milling, refining and end use of thorium. Statistics on domestic activities are classified as of the AEC act of 1954. Tables on p 81 indicate mineral production and end use from scattered official sources.

Domestic reserves of monazite are adequate for non-energy requirements. Domestic processing facilities are more than adequate for non-energy and wartime needs, but inadequate to handle any large-scale energy program; and processing methods are expensive.

With the demise of the gas mantle industry, before WWI, U. S. monazite mining came to a near standstill until 1948. USBM and Geological Survey helped start a domestic mining program in the late 1940's. Domestic mining was able to function in Florida, Idaho and here and there in the Southeast Atlantic States, only because Brazil and India instituted their thorium export bans at that time.

Later, Brazil relaxed the ban to allow certain exports of thorium on a Government-to-Government basis and with production from South African deposit coming into the U. S. at the present time, U. S. monazite mining in Idaho has been curtailed.

Idaho monazite has been hampered by lack of market for accessory heavy minerals obtained with the monazite. One producer in the area is Baumhoff-Marshall Co., Cascade Valley, whose unit is capable of handling 5,000 cu yd sand a day. At least two other

AEC Authorizations for Thorium Purchases*

(U. S. non-energy uses, 1950–54. In pounds ThO_2)

Industry	1950	1951	1952	1953	1954
Magnesium alloys	.....	.....	.....	3,600	4,647
Gas-mantle manufacture	48,471	31,132	25,427	8,707	9,765
Refractories and polishing compounds	1,889	3,382	1,157	236	24
Chemical and medical	2,097	6,246	11,064	5,179	3,738
Electrical	314	1,457	277	1,222	2,016
Total	52,771	42,217	37,925	18,944	20,190

*From Thorium by John E. Crawford, A Chapter From *Mineral Facts and Problems, Bulletin 556*, U. S. Bureau of Mines.

U.S. Consumption of Thorium 1947-1951*

(in pounds ThO_2)

End Use	1947	1948	1949	1950	1951
Gas mantles	26,658	36,697	44,621	48,471	31,132
Refractories and polishing	3,110	1,634	1,847	1,889	3,382
Chemical and medical	1,176	1,767	596	2,097	6,246
Electrical	1,283	427	237	314	1,457
Total	32,227	40,525	47,301	52,771	42,217

**Minerals Yearbook* by U. S. Bureau of Mines

dredges are in the area, but are reported to be idle at this time.

Small amounts of monazite are produced in the Carolinas, at Humphreys Gold plant in Jacksonville, Fla., and in the gold placers of Georgia and Alabama. However, without a guaranteed and high price for ore and an assured outlet for secondary minerals, domestic mining program cannot compete with South Africa.

Canada has no domestic mining or refining program for thorium at this time.

Australia is becoming more active in the industry and is offering monazite to U. S. refiners.

India, after banning exports in 1948, set up a plant of French design to refine monazite. Thorium is being stockpiled and rare earths are exported.

Brazil, in the days of the gas mantle, produced most of the world's monazite. In 1907, over 7,120 tons concentrate were produced; but in the period 1914-1941 Brazil produced less monazite than in 1907. Ban on exports has been relaxed to allow shipments to other Governments.

Union of South Africa has one producer. Anglo America Corp. of South Africa, Ltd., is shipping massive (but low ThO_2) monazite to U. S. and U. K. Deposit is the Van Rhynsdorp and runs 70% monazite and about 5% copper. Mill has capacity of 8,000 tons monazite per year. All the production from this mine, through March 31, 1956, has been sold and most of it is coming to U. S., assigned to Lindsay Chemical.

Ceylon produced 14 long tons monazite in 1952. Belgian Congo produced 37 tons in 1951, 14 tons in 1952 and 11 tons monazite in 1953.

Madagascar has one major deposit of thoraninite. Discovered and being worked by P. Hebon near Fort Dauphin, this deposit has produced 20 long tons thoraninite, running 13.8% U_3O_8 and 66.4% ThO_2. French Government declined comment on size of deposit and refining process.

U. S. Imports of Thorium-bearing Ores and Compounds*

(in short tons)

Year	Brazil	India	Others
1936	...	119	488
1937	...	336	...
1938	110	346	...
1939	54	1,336	170
1940	201	2,766	...
1941	747	2,763	...
1942	1,346	3,052	...
1943	1,911	3,069	...
1944	...	384	...
1945	437	112	...

**Mineral Trade Notes*, a monthly publication by U. S. Bureau of Mines. Data since 1945 has not been released.

On the refining scene there is at present no large-scale metal producing industry other than the AEC. Westinghouse and Metal Hydrides produce only minor amounts of metal. Metal processes are expensive and less expensive ones are needed before thorium metal can assume large scale usage.

Further developments in the domestic refining picture are: (1) Lindsay Chemical has just completed a $2.5-million plant for the processing of thorium and rare earth compounds. The separate rare metals and their compounds will be made available to potential users.

(2) Batelle Institute has announced that they have developed a simplified refining process.

(3) W. R. Grace & Co. recently announced that Davison Chemical Co. and Rare Earths, Inc., a wholly-owned Grace subsidiary, have joined in a program of expanded production, sales, research and development of thorium and rare earths. Rare Earths is at Pompton Plains, N. J., and Davison is located at Curtis Bay Works, Md.

"We look for steadily increasing use of thorium and rare earths. There is a temporary oversupply of rare earths in prospect . . . there should be a continuation of the research devoted to new uses for rare earths to supplement that which this company is continuously pursuing", stated Richard Mandle, vice president of Rare Earths.

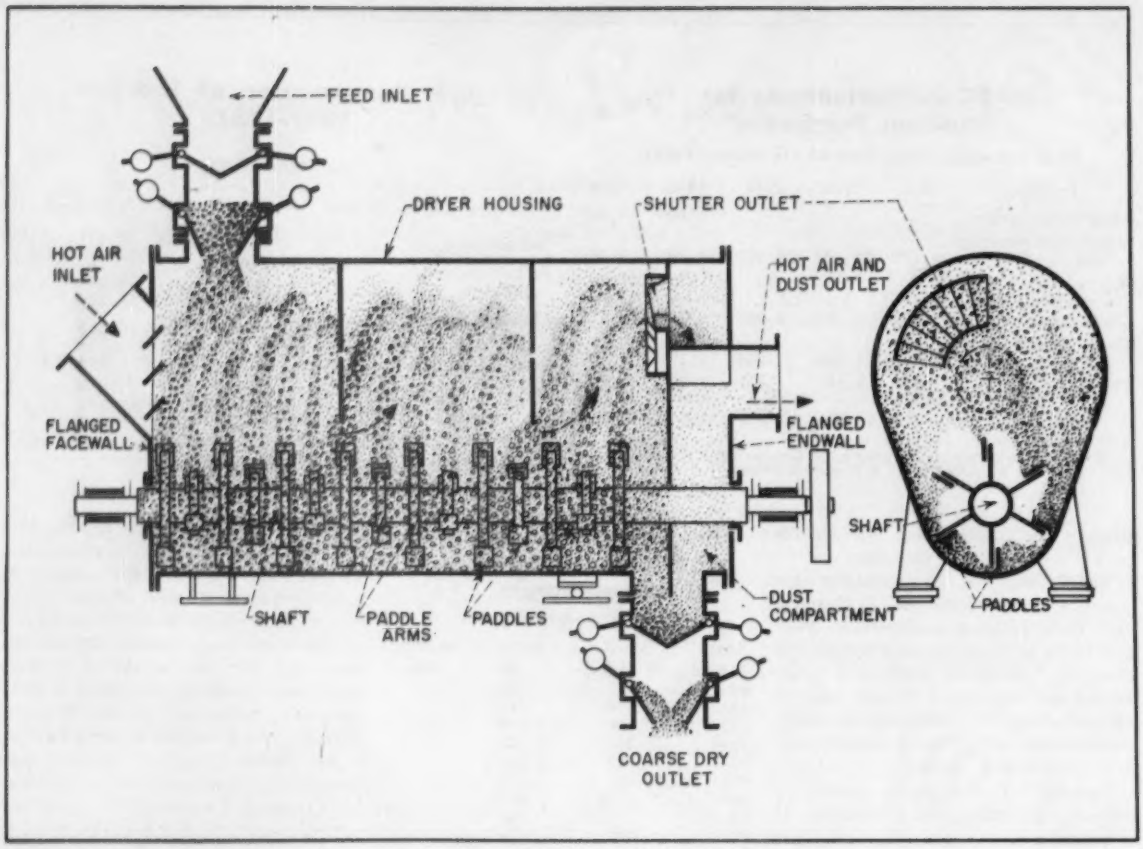
(4) Thorium Corp. of America, not presently a producer and controlled by Colonial Uranium Co., has reportedly entered into a contract with Colorado School of Mines Research Foundation. Study is to determine chemical processing method for treating thorite-type ore.

TCA recently stated that they had a $1-million contract for thorium concentrates with Lindsay Chemical. TCA is reported to hold 20% interest in Colorado Thorium & Metals Co., a Climax Molybdenum subsidiary and an interest in Rare Earth Mining Co., a Lindsay-Climax holding.

(5) Recently, "big" strikes of monazite were reported in California and New Mexico. Lindsay is reported to have entered into an agreement with Wet Mountain Mining, Inc., Colo., to take 5 tpd 10% product.

On the foreign scene, Ceylon will soon ask for bids on monazite concessions in the coastal beach sand deposits. A new deposit described as the "world's biggest" has been found in Minas Gerais district, Brazil.

Paul F. C. Gregory, president of Societe de Produits Chimique des Terres Rares, summed up the thorium picture saying, "Regarding the help we need, we repeat that it is primarily a clarification of the thorium situation, in the form of long term contracts for thorium oxide, at a price taking into account the prevalent (high) cost of raw materials. Stockpiling might help."



STATIONARY RAPID dryer uses paddle-equipped shaft to keep feed up into hot air and moving through the dryer. Unit, of direct current design, requires 800-900 kilocalories heat to evaporate one pound of water; is small and compact.

How a Stationary Dryer Cuts Costs

LATEST INNOVATION in European processing equipment is the stationary rapid dryer designed and developed by Hazemag, Ltd., Münster, West Germany. Claiming many cost-cutting advantages over conventional rotary devices, this stationary dryer is small, compact, air-tight throughout and is claimed to have exceptionally low heat requirements.

Dryer has a rotating shaft equipped with paddles or shovels; eliminating necessity of rotating and inclining entire shell as in conventional units. Shaft paddles keep material to be dried up into the hot air stream and at the same time moves material through the dryer.

As can be seen from the drawings above, unit is a short, egg-shaped kiln with the shaft passing through the lower part of the shell. Wet feed enters dryer and is struck by hot air blast coming from the preheater. Heater can be coal, oil or gas fired.

Air blast propels fines, which are dried instantly, toward discharge end of the dryer. Heavier particles, too large to be airborne, fall to the bottom of the shell. Paddles or shovels on the shaft lift and throw heavy particles up into hot air stream and at the same time propel them toward the discharge end of the dryer. Each particle is repeatedly thrown up into hot air stream; keeping it almost constantly enveloped by moving air. Intensified and continuous mixing in the hot air absorbs moisture in the feed so that the product reaches discharge end in a thoroughly dry state.

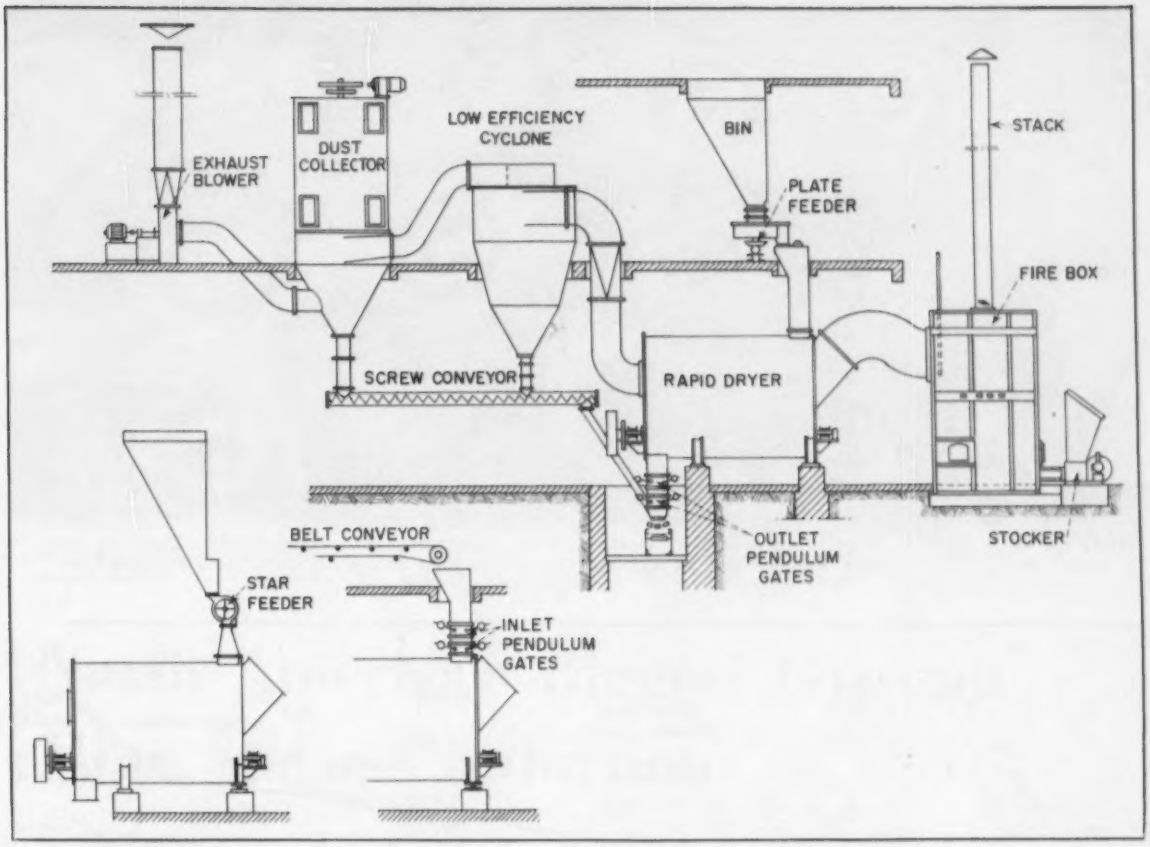
System Must Be Air-Tight

Dryer works best on finely ground material and can be used without the preheater to dry moist material. Dust compartment (drop-out box) and coarse product discharge are located at the exit end of the dryer. Fine airborne dust is collected and returned by screw conveyor to the coarse particle discharge through an inlet pipe. Return dust, heavier dust in the drop-out box and coarse particles all discharge through same pendulum gates.

System is direct-current drying and air-tight throughout. Draft is furnished by exhaust blowers placed behind dust collectors or by means of the draft-inducting spiral dust collector described below.

To keep the system air-tight, three types of feeders are employed as indicated in the drawing. Rotary or star valves may be used; but star valves are not entirely satisfactory for material containing large particles, which tend to jam the knife edges. Star valves are also expensive to make and to keep air-tight.

Rotary circular-plate feeder seems to be preferred. Third feeding method uses two pair of pendulum blast gates or flaps to keep air in or out. When flaps are used, one pair always remains closed while the other is open.



DESIGNED to keep the system air-tight from heater to blower, the dryer employs a variety of air-tight feeders and outlets. Efficiency of the stationary kiln offers additional savings in floor space and lower operating cost potential.

Pendulum flaps and screw conveyors are used for all discharge outlets.

Several combinations of dust collecting equipment are employed in connection with the dryer. As shown in the drawing, collecting apparatus may be a low-efficiency cyclone in series with a standard dust collector, or a low-efficiency cyclone only.

Collecting system may also be a low-efficiency cyclone in series with one or more high-efficiency cyclones. Fourth alternative is called a spiral dust collector. Device serves as dust collector and draft-inducing unit. Equipment will be elaborated on at some future date, but for the present it is sufficient to say, that the spiral collector consists of a number of motor-driven material handling blower wheels mounted in a housing. Operating at 700 rpm, wheels provide draft for the dryer and at same time separate the dust from the air; collecting and holding it on spiral blades of the wheel.

Automatically and alternately in turn, wheels slow down to 40 rpm, where dust moves toward the center of the wheel and is discharged by screw conveyor. Second screw conveyor transports dust back to dry product discharge at the dryer.

Common practice calls for screw conveyor discharge from all cyclones and dust collectors as a means of keeping system air-tight. Whenever possible same conveyor serves all the collecting equipment.

Costs Are Low

Construction costs for rapid dryer are low in comparison with conventional rotary units. Shell can be made of lighter gage steel. Trunion gears are eliminated. Lagging the shell is apparently not necessary. Cost fob European ports, not including burner, combustion chamber and dust collectors is as follows:

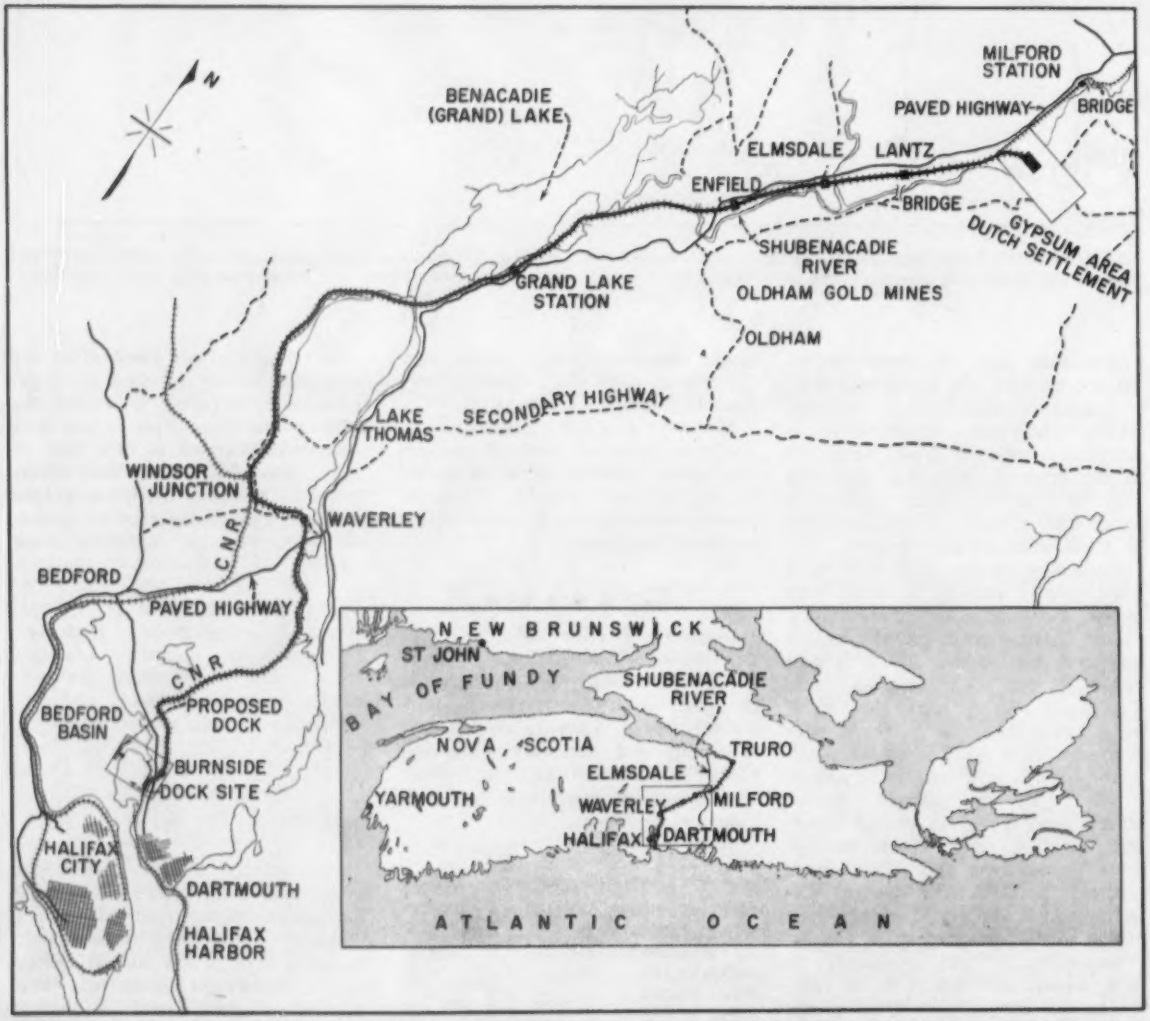
	Cost	Dimensions (ft) Length	Width	Height
AS 1	$5,530...	14	4.1	5.9
AS 2	7,586...	16	5.4	7.9
AS 3	11,094...	17	7.2	9.9
ASS 3	13,150...	19	7.6	9.9
ASS 4	18,705...	20	8.2	11
ASS 5	20,695...	23.5	9.0	11.9
ASS 6	22,205...	26	9.9	14.5

Operating costs of rapid dryer are lower than rotary of same capacity. Horsepower required to rotate the shaft on Hazemag dryer is less than horsepower required to turn shell of rotary unit. Fuel costs are lower. 800-900 kilocalories needed to evaporate one pound of water as against 1400-1500 kcal on rotary of same capacity.

	Water evaporation tons per hour	Power required in kw	Kwh. per ton water
AS 1	0.35	20	57
AS 2	0.95	30	32
AS 3	1.4	42	30
ASS 3	2.0	52	26
ASS 4	2.5	65	26
ASS 5	3.75	78	21
ASS 6	5.0	92	19

Manufacturer claims that rapid drying action cuts down time-to-dry and permits higher feed rates when compared to rotary unit of same size. Operating cost is low and efficiency high. Compactness, small size and economy of floor space are added features.

FIRST QUARRY BLOCK, about 15 acres, has been cleaned to minus 10 elevation exposing 3-million tons of gypsum. With deepening, block should furnish 75-million tons of rock. Total mine reserves are more than 200-million tons.



NOVA SCOTIA gypsum mine of National Gypsum (Canada) Ltd., is located at Milford with dock facilities near Dartmouth.

BLOCKY ORE presents problems although gypsum is soft rock for drilling.

HAULAGE can be handled at present by six 22-ton Euclids, transporting ore from three 2½-yd shovels to the primary crushing plant, handily located in the pit floor.

North America's Biggest Gypsum Mine Starts Production

EDWARD D. BROWN
Vice-President
National Gypsum (Canada) Ltd.

AFTER TWO YEARS of diamond drilling, two more years of construction, and an expenditure of $6-million, North America's largest gypsum deposit has moved into production in Nova Scotia. National Gypsum (Canada) Ltd.'s proven reserves top 200-million tons and at a possible production rate of 2-million tons a year, the quarry output will boost American gypsum supply by about 20%.

To do this job efficiently National has a highly mechanized operation from the mine and plant at East Milford to the shipping facilities at Wright's Cove, 31 miles away.

It was in July 1951, that the first diamond drill was moved to the East Milford area where National Gypsum had acquired gypsum rights to 12,000 acres of land known to be underlain by the gypsum-bearing rocks. Two years later and after 50,000 ft of drilling, reserves of better than 200-million tons of gypsum had been proven—half of it in the immediate vicinity of the present quarry.

All drill cores were split and independent assays made at the Nova Scotia Technical College and at National's own laboratories. Based on these, an area of 140 acres was selected as the optimum quarry site because of its attractive features: minimum overburden, uniform grade of rock, and an adjacent area of reasonably flat land for buildings and spoil dumps. This area was redrilled to double check our previous findings and exhausive tests carried out to ascertain the gypsum's characteristics and workability.

Overburden of this quarry block varies from 4 to 50 averaging 25 ft or less. To date we have exposed and cleaned about 15 acres which contain, to the minus ten elevation, about 3-million tons of rock. To clean the quarry block we expect to move a total of about 7-million yards of clay, of which about ½-million have already been moved.

At present production rates this will give us a run of approximately 20 years at the minus 10 quarry floor, and by deepening the quarry, an ultimate recovery of 75-million tons of gypsum. The quarry will then have to be extended eastward and southward where the overburden-to-rock ratio is somewhat higher and the quarry haul will be greater. But that is looking into the next century and of academic interest only.

One thousand acres have been purchased outright to supply area for location, roads and railroads, spoil areas, and to allow for construction and future quarry expansion.

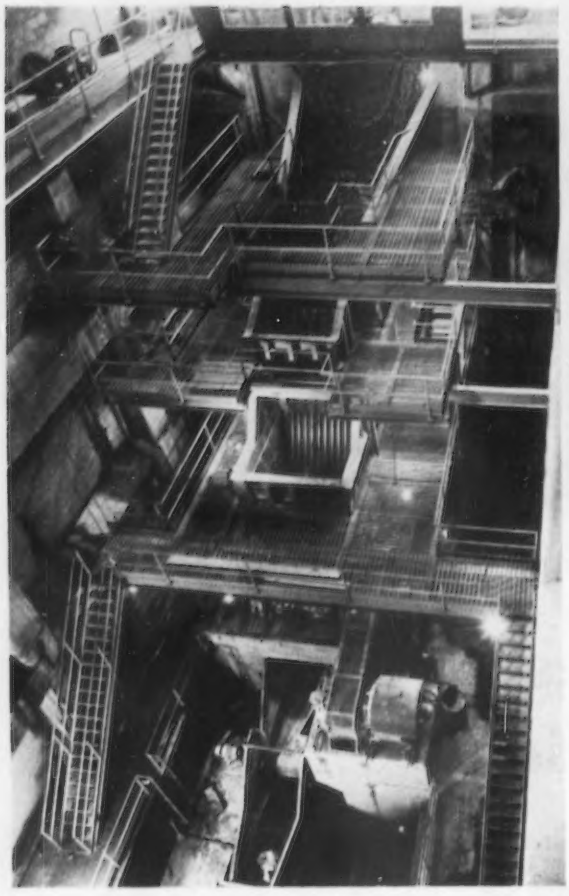
To establish our plant, we had to move over 1½-million yards of dirt and over 500,000 tons of rock. The bottom of the primary crusher is 155 ft below the original ground surface and 110 ft below the top of the original gypsum.

Two major railway cuts were required to give favorable haulage grades and to avoid as much as possible covering good mineable gypsum. These cuts were both over 1,000 ft long and 35 to 50 ft deep. A railway bridge 270 ft long with 100-ft clear center span, was constructed to cross the Shubenacadie River. It is designed to handle the heaviest trains operated by the Canadian National Railways.

An area of more than 30 acres had to be cleared of forest to locate the plant buildings and railway marshalling yard. The clearing was started December 1953. Construction began May 1954, and was finished a year later.

Production

Mining in 70-ft benches, we maintain an average ore grade of 86%. The gypsum varies from 82 to 94% but by keeping a number of faces



SURGE PILE, 10,000 tons, is over a concrete tunnel for easy reclaiming by conveyor belt to the nearby carloading building.

PRIMARY CRUSHER is located in the pit, 110 ft below top of original gypsum. The 36- x 72-in. single roll crusher reduces 4-ft blocks minus 12 in. at the rate of 800 to 1,200 tph.

open average grade can be maintained.

Horizontal drilling is handled by an auger drill using 5-ft additions. It drills up to 80 ft at a speed of about 6 fpm. Vertical holes, 2 in. in diameter to 80 ft are drilled by an Ingersoll-Rand Challenger unit.

Averaging spacing of the blastholes is 8 ft and 4 rows of holes are used. More than 100,000 tons of rock are broken in one blast.

Ore is inclined to be blocky and secondary breaking by dropball is often required after initial blasting.

Three 2½-yd Northwest diesel shovels handle the loading with six 22-ton Euclid trucks hauling the ore to the crusher hopper. About 5500 tons of ore can be mined in an 8-hr shift.

Primary crusher, fed by a 6-ft pan feeder is a Pennsylvania single roll crusher 36-in. in diameter 72-in. long. It handles 4-ft chunks of rock at the rate of 800 to 1200 tph, reducing them to minus 12 in.

No. 1 and No. 2 conveyor belts, 48-in. wide, travelling at 600 fpm lift the crushed rock to the top of the secondary crusher building where it passes over a self-clearing Tyrock screen into a 36x60-in. single roll Allis Chalmers crusher which reduces the ore to minus 4 in.

Capacity of this plant can easily be increased should it become desirable.

Another belt conveyor lifts the rock 75 ft to form a 10,000 ton surge pile from which it is recovered through a tunnel below the pile. The rock travels by belt from the tunnel to the carloading building. Here a shuttle belt spreads the rock over the length of the railway cars which the diesel electric locomotive spots at the car location station. The present operating schedule is to load 70-75-ton cars per eight hour shift. These are stored in the marshalling yard until removed in trains of 35-40 cars by the Canadian National Railway crews who make the 31-mile haul to Wright's Cove twice daily.

Office and stores are in a U shaped building with 2,100 ft of office space, 3,600 ft of stores, a boiler room, men's wash and locker rooms and a First Aid Office. The service building is 80x110 ft and contains five repair trucks, two for tracked vehicles. They are equipped with heavy hoists, ventilation systems and grease pits. There is also a machine shop portion containing shapers, lathes, treading machine, radial drills, drill press, valve refacer, steam jenny and other tools, a battery room, tire repair and storage room, tool room and office. A mezzanine floor above these rooms is used for storage.

There is a grease service and storage building located near the ramp down to the quarry and also an engine house for the shunting engine. The plant area is provided with a fire hydrant system using water from the river where we have a pump house with a 750 gpm fire main pump and a 200 gpm utilities pump. Next to the shop building is a pad for washing down the vehicles.

Shipping Facilities

At Wright's Cove we have acquired by lease and purchase over 150 acres of land. This gives us a storage and shipping area on the protected Bedford Basin as well as available land for expansion should local markets develop at a later date.

Loaded cars are handled by a

CARS ARE LOADED with blended rock to be shipped 31 miles from East Milford quarry to docks at Wrights Cove.

LOADING BOOM, capable of loading ships at 5,500 tph rate, is expected at present, to handle 12 ships a month all year long.

OVER SHE GOES! Rotary car-dumper at Wright's Cove will handle 35 to 40-car trains. Ore goes to 200,000-ton stockpile.

locomotive identical to that of the quarry. It spots cars on the car-dumper platform where they are turned upside down bodily and the rock dumped into a hopper. From here belts take it to the top of the stockpile where a shuttle belt spreads it along the 500-ft long, 200-ft wide and 90-ft high pile to form storage of upwards of 200,000 tons. This is enough for almost 2 months shipping at three 10,000 ton boats a week.

Beneath the pile is a concrete tunnel, the roof of which contains large chutes. Beneath these a 60-in. reclaiming belt carries the rock to the dock where it is elevated on a second belt to the ship-loader.

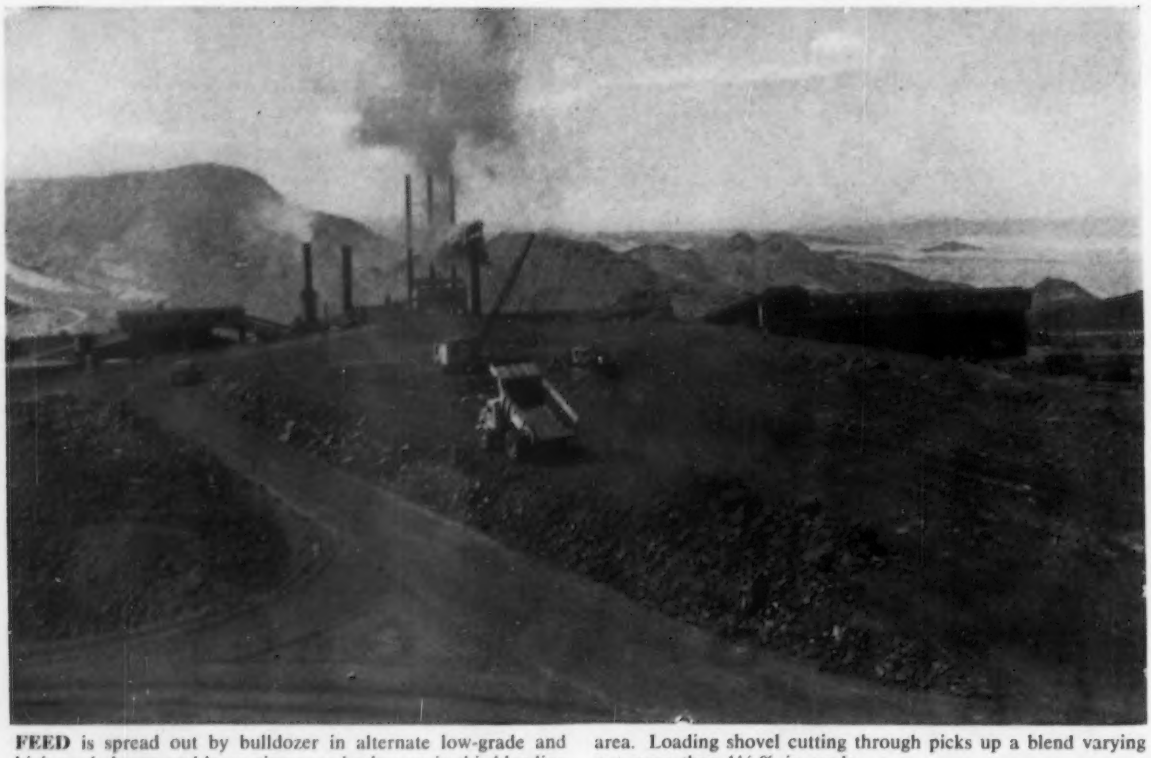
This loader is similar to those used at the Seven Islands' Iron Ore shipping dock. It travels on rails on top of the dock, has a 60-in. belt and a 72-ft retractable boom which, in use, drops the gypsum into the ships' holds. It is capable of loading ships at the rate of 4,000 tph and will probably load and trim ships up to 15,000 tons registry. The entire loading cycle is controlled by the operator in the cabin of the ship-loader. It is only necessary to have men in the reclaim tunnel to operate the ore chutes. Shipping, like the mining operations, will continue the year 'round. We expect to handle about 12 ships a month. Turn around time will average about 5 hours.

Working Force

The entire operation is mechanized to a very high degree. From the face of the quarry to the ship's hold the rock is handled mechanically; this flow is controlled by electronic hook-ups and safety relays which protect the equipment and remove the drudgery and danger usually associated with rock handling and conveying. The force of 110 men at the quarry and 20 at the dock site are largely maintenance, operating, and stripping personnel in character. The flow sheet embraces design and practice which have been proven in the province's gypsum industry. The construction is generally of conventional materials and is adapted to our climate. Other than expendable portions which will have to be replaced from time to time the design life is expected to be a minimum of 50 years.

Dock design is an innovation in this area where the lack of suitable overburden for pile penetration was overcome by placing a mat of fill on the bottom and then driving the steel piles. This was then dredged to give a minimum of 33 ft at low water. The dock is almost 650 ft long and contains 1,000 tons of piling, 23,000 cu yd of fill, a quarter million pounds of reinforcing steel and 2,500 cu yd of concrete. For the entire job we used 2,300 tons of structural steel, 670 tons of reinforcing iron, 10,000 cu yd of concrete. There are more than 8,000 ft of rubber belting, 2,500 hp of installed motors and 4,000 hp of mobile equipment.

We moved over 2,000,000 cu yd of rock and dirt, laid over five miles of rails and spent roughly $6 million. Of this, the construction force was mostly local with, in some phases, supervision by American specialists. The purchase of equipment and steel, was based on availability, almost equally divided between Canada and the United States. The over $1 million worth of earth-moving equipment is almost entirely of American origin as well as crushers and car-dumper.



FEED is spread out by bulldozer in alternate low-grade and high-grade layers and large pieces are broken up in this blending area. Loading shovel cutting through picks up a blend varying not more than 1½% in grade.

How Manganese, Inc. Upgrades

PLANT SITE of Manganese, Inc. occupies about 20 acres, 6 miles east of Henderson, Nevada. Rebuilt after a fire in 1953, the new mill has a capacity of 1,200 tons per day. Operations were resumed in February 1954.

PRODUCT, consisting of nodules with a maximum diameter of 5 in., is blended to specification (45% manganese and less than 1% copper, lead and zinc) at this storage area prior to loading out for shipment.

Complex Three Kids Ore

J. B. HUTTL
Associate Editor

UPGRADING a complex manganese ore by flotation and producing high-grade nodules from those concentrates is a difficult proposition at best, but the men running Manganese, Inc.'s 1,200-ton-a-day plant near Henderson, Nev., are taking it in stride. Considerable ingenuity was required to evolve the process which may well be unique in the large investment required per ton of capacity and in the variety and quantity of reagents used. Here's a look at the Henderson operation from the mine to the 45% Mn nodules produced.

Monthly Averages
September 1, 1954—
May 31, 1955

Mill feed, short tons	23,592.2
Ratio of concentration	2.37 : 1
Recovery, percent	78.7
Concentrate, %Mn	41.85
Reagent, Diesel oil, lb/t	155.9
Reagent, soap skimmings, lb/t	74.7
Reagent, Oronite-S, lb/t	9.57
Reagent, sulphur dioxide, lb/t	9.25
Steel consumption, grinding lb/t	0.39
Percent minus 200 mesh in flotation feed	61.7
Power, grinding, kwh/t	6.0

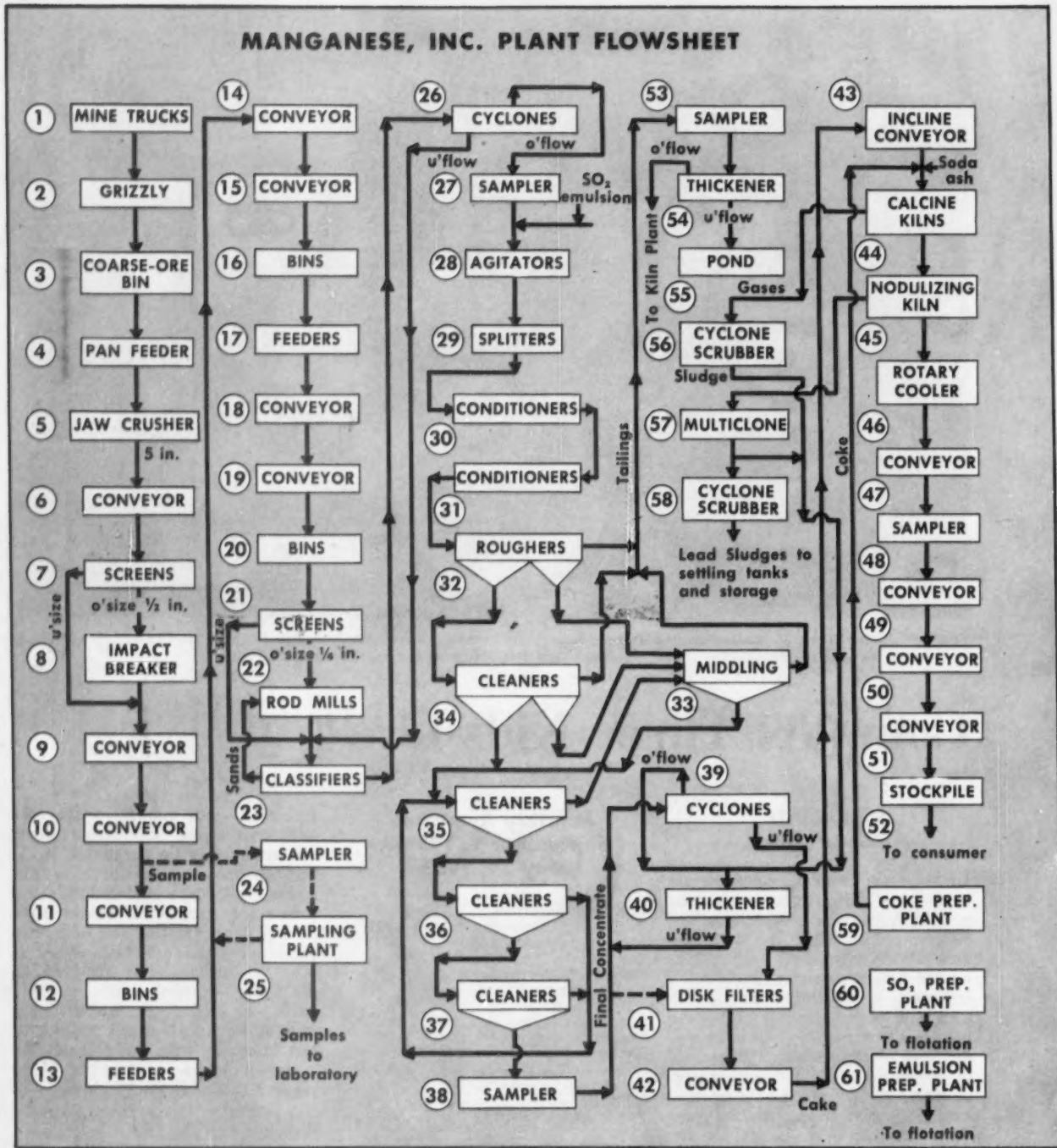
Deposit and Ore Complex

According to C. B. Hunt, V. E. McKelvey and J. H. Wiese (USGS Bulletin 936-L), the manganese ore at the Three Kids mine is a secondary deposit and consists of wad interbedded with lake or playa sediments belonging to the Muddy Creek formation of Pliocene Age. Where the manganese content is as high as 30%, the wad forms thick, massive beds separated by thin almost barren partings. Where mineral content is low, the wad forms very thin lenses or small irregular blebs scattered through sandstone, or a cement for the sand grains. The zone of manganiferous beds ranges from about 10 to 75 ft in aggregate thickness, but at most places the thickness varies between 25 and 40 ft.

Faults, striking N to NW, enclose the mine area, with the easterly dipping Lowney fault on the west and the Extension series cutting off the orebody on the east. Striking north and further breaking up the sunken block between the two structures is the Annex fault, which displaced the manganese beds some 80 ft downward on its east flank. On the west of it, the ore forms a syncline plunging north, with the southern half representing the "A" pit currently under development. The productive "B" pit covers most of the area between the Annex and Extension faults. Most of the ore in this pit was stripped by the Manganese Ore Co. during World War II.

Two types of ore are found, silicious and sulphate. Chief manganese minerals in both are hollandite and coronadite. Gangue minerals in the silicious ore include quartz, chalcedony and montmorillonite. These plus celestite are found in the sulphate ore. Principal impurities are silica, silicates, alkaline earth sulphates and carbonates. The ore is sandy, porous and spongy, accentuating crushing, grinding, conditioning, flotation and handling problems.

Developed ore is mined by conventional open pit methods. These operations are carried out under the



LEGEND

1. Euclid trucks from mine or blending piles
2. Steel grizzly, 24x30-in. openings
3. Coarse-ore bin, 50 tons live load
4. Pan feeder, 54 in. by 10 ft-2 in. S-A
5. Traylor Type H 30x42-in. jaw crusher
6. Belt conveyor, 30-in., with Stearns magnetic pulley
7. Symons 4x8-ft rod-deck screen, ½-in. openings
8. Cedar Rapids 30x30-in. impact breaker
9. Belt conveyor, 24-in.
10. Belt conveyor, 24-in., with Merrick Weightometer
11. Belt conveyor, 24-in., with S-A tripper
12. Blending bins, 1,400-ton capacity
13. Hardinge feeders
14. Belt conveyor, 20-in.
15. Belt conveyor, 20-in., with S-A tripper
16. Bedding bins, 360-ton capacity
17. Jeffrey roll feeders
18. Belt conveyor, 20-in.
19. Belt conveyors, 20-in., with S-A trippers

LEGEND *(Continued)*

20. Two rod mill bins, 120-ton capacity each, equipped with Merrick 20-in. Feedoweights
21. Two Symons 3x6-ft rod-deck screens, ¼-in. openings
22. Two Marcy 7x10-ft rod mills
23. Two Akins 78-in. classifiers
24. One Geary-Jennings sampler
25. Sampling plant
26. Eight 12-in. cyclones, four per mill circuit
27. Two Geary-Jennings samplers, one per mill circuit
28. Two agitators, one per mill circuit
29. Two Splitter boxes, one per mill circuit
30. Four Wemco 66-in., 8-cell conditioners, two units per mill circuit
31. Two Wemco 66-in., 7-cell machines, 6 cells used as conditioners, one unit per mill circuit
32. Two Wemco 66-in., 7-cell roughers, one per mill circuit
33. Two Wemco 66-in., 4-cell middling machines, one per mill circuit
34. Two Wemco 66-in., 5-cell cleaners, one per mill circuit
35. Two Wemco 66-in., 4-cell cleaners, one per mill circuit
36. Two Wemco 66-in., 3-cell cleaners, one per mill circuit
37. Two Wemco 66-in., 3-cell cleaners, one per mill circuit
38. Two Geary-Jennings samplers
39. Eight 12-in. cyclones, two units ahead of each filter
40. Dorr traction thickener, 120-ft
41. Four 8½-ft, 10-leaf American, Oliver disk filters, two per mill circuit
42. Belt conveyor, 24-in.
43. Belt conveyor, 24-in., with Merrick Weightometer
44. Two calcine kilns, 8x150-ft
45. Nodulizing kiln, 10x150-ft
46. Rotary cooler, 8x96-ft
47. Pan conveyor, 18-in.
48. Denver nodule sampler
49. Belt conveyor, 18-in., with Merrick Weightometer
50. Belt conveyor, 18-in., with S-A tripper
51. Stacking conveyor, 18-in.
52. Stockpile area
53. Two Geary-Jennings tailings samplers, one per mill circuit
54. Dorr traction thickener, 165-ft
55. Storage pond
56. Cyclone dust scrubber for calcine kiln gases
57. Multiclone for nodulizing kiln gases
58. Two-stage cyclone scrubber for nodulizing kiln gases
59. Coke preparation plant
60. SO_2 preparation plant
61. Emulsion preparation plant

SECONDARY CRUSHING is the function of this 30x30-in. impact breaker which takes a 5-in. feed from the primary jaw crusher and reduces it to ½-in.

supervision of the company's mining department headed by Victor Howard, mine superintendent, and John Atkins, chief mine engineer, by the Isbell Construction Co. of Reno, Nevada, with George Laughton, superintendent, in charge.

Blastholes are drilled by a truck-mounted Joy 225-A rotary drill unit with a dust collecting system and a 640-cfm Joy compressor. The 4¾-in. holes are put down with Varel rock bits and Varel finger bits, depending on the nature of the ground drilled. Average drill speed is 2 ft of hole a minute. The rock bit is good for about 3,000 ft, while the life of the finger bit varies from 1,500 to 1,800 ft. As cost of the rock bit is much higher than that of the finger bit, the latter is used wherever possible.

Bench heights average 30 ft. The drilling method is designed to effect optimum fragmentation. Practice is to blast a center cut on each bench, followed by blasting successive rings into the resultant hole. The holes drilled on the benches vary in depth, maximum being 33 ft. Spacing is on 8- to 9-ft centers. The blast is timed by electric delay detonators. The powder charge in each hole consists of a primer section made up of two 1½x8-in. sticks of 60% powder and half a bag of Flodyn 40% free-flowing bag powder. This is followed by 1-ft section of crushed rock upon which alternating decks of 30% Atlas 4x16-in. cartridges and bag powder are placed to within 6 ft of the collar of the hole. Primacord is used for the full length of the hole to carry the detonation through the decked charges. Powder consumption is 1 lb per ton of rock blasted.

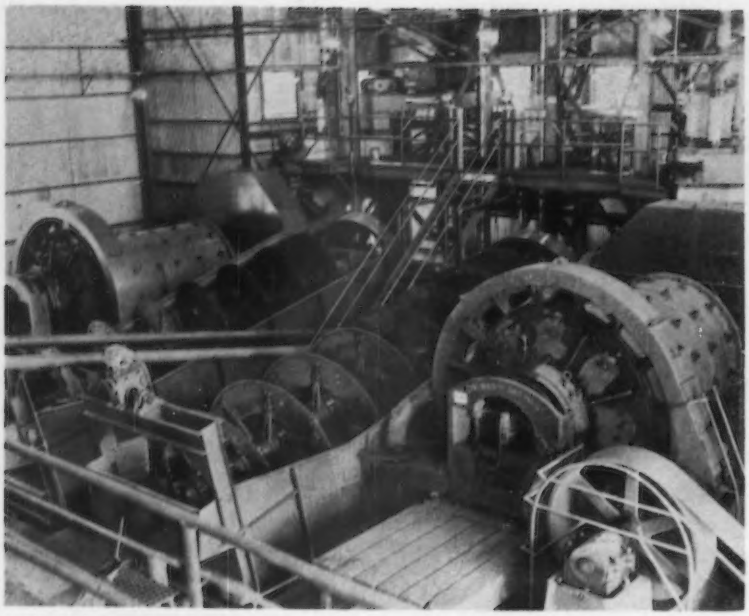
Broken ore is hauled to blending piles. This practice provides a mill feed uniform in grade and gangue minerals essential to optimum flotation. The piles, established on a bluff near the crushing plant, contain from 20,000 to 30,000 tons each, and are made up of a series of superimposed 2-ft layers of ore of varying grade, spread by a Caterpillar D6 bulldozer. As a low-grade layer alternates with a high-grade layer, the dipper of the loading shovel cutting through the face of the pile mixes the material and a uniform blend results. Grade variation seldom exceeds 1½%. Desired mill feed contains about 20% manganese. Lead content in the mine-run ore averages plus 1%.

Equipment used in the pit area includes a Northwest Model 80 2½-yd power shovel for bench loading, a Northwest Model 6 1½-yd power shovel for blending pile loading, and Model T (22 ton) and Model F (16 ton) Euclid trucks. Cleanup work in the pits is done by a Caterpillar D7 bulldozer.

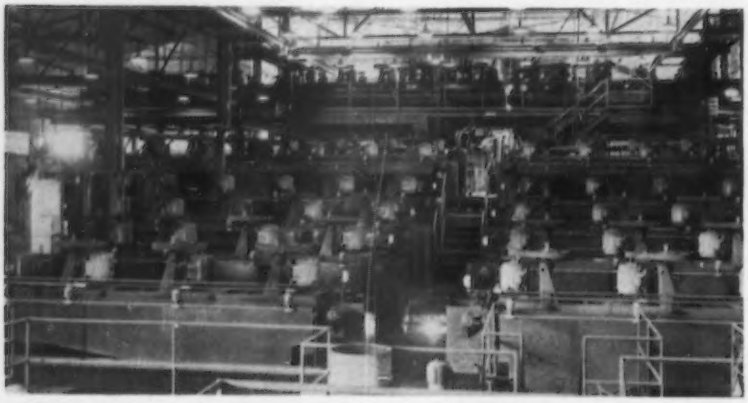
Loaded trucks coming from the benches are sampled at a weighing station before proceeding to the stockpiles. Secondary breaking at the blending piles is carried out with a 2,350-lb drop ball handled by a Northwest Model 25 shovel equipped with a 35-ft boom. Haulage distances from benches to the blending pile area average less than ½ mile. From the blending piles to the chute ramp at the crushing plant is about 500 ft.

Modern Design For New Mill

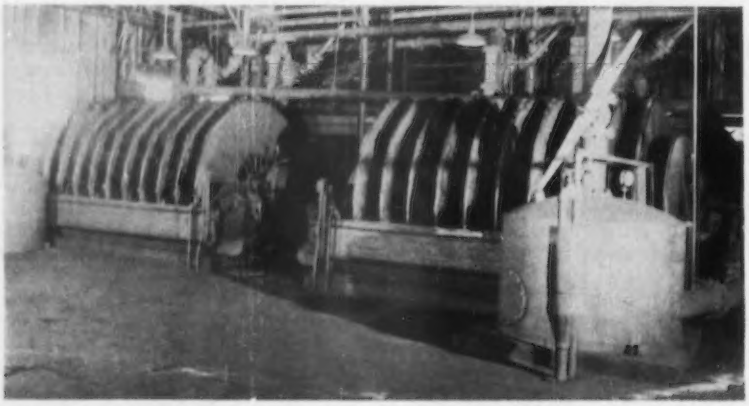
The new mill beneficiating manganese oxide ores from the pit was placed into operation early in 1954. With a capacity of more than 1,200



GRINDING is done by two 7x10-ft rod mills in closed circuit with two 78-in. Akins classifiers whose overflow is pumped to four 12-in. cyclones.



FLOTATION PLANT has two parallel circuits of 16 conditioners on the upper deck, 6 rougher cells on the next level and then four stages of cleaners.



FILTRATION is handled by four 8½-ft, 10-disk filters after prior treatment by two 12-in. cyclones installed above each filter unit to thicken the feed.

THE LATE HEWITT S. WEST was president of Manganese, Inc.

dry tons of ore a day, it is designed for economical upkeep and easy supervision and control. The steel-constructed building houses two separate mill circuits of 600 tons each.

Several changes are evident when comparing the present flowsheet with that of the mill destroyed by fire. Feed tonnage and quantity of reagents are closely controlled by Merrick Feedoweights and metering pumps, conditioning capacity has been increased, and use is made of cyclones in the ball mill-classifier circuit and for dewatering final concentrates ahead of filtering. The cyclones are made at the plant after the design evolved by S. J. McCarroll, general superintendent. John S. Anderson is in charge of mill operations.

Treatment of the mine-run ore containing about 18% moisture, as shown in the accompanying flowsheet, involves two-stage crushing to 90% minus ½ in., closed circuit grinding to about 60% minus 200 mesh; conditioning; rougher flotation; 4-stage cleaning; and filtering. The two crushing stages are successively carried out in a 30x42-in. Traylor jaw crusher, set to give a 5-in. product, and a 30x30-in. Cedar Rapids impact breaker receiving the oversize from a 4x8-ft Symons rod-deck screen with ½-in. openings installed between the two units. Worn impeller bars of the impact breaker are periodically built up with stainless-steel welding rods and hard faced. Maximum service from one set of bars to date actually has been 230,523 short tons.

Secondary crusher product is belt-conveyed to a battery of 1,400-ton blending bins served by a belt conveyor-tripper system. Tonnage received from the crushing plant is constantly checked by a Merrick Weightometer. Samples taken ahead

F. A. McGONIGLE is vice president and general manager of the company.

S. J. McCARROLL is general superintendent of operations at Henderson, Nev.

of the bins by a Geary sampler go to a small sampling plant equipped with a 15-in. Traylor gyratory crusher and two Vezin samplers in series. Material, withdrawn from the blending bins by Hardinge feeders, is transported by a second belt conveyor system to bedding bins with a capacity of 360 tons ahead of the grinding department. The crushing plant and both ore storage systems are served by three Sly dust collector units.

Grinding

Ore from the bedding bins, comprising blended mill feed, is belt-conveyed to two 240-ton storage bins in the grinding department. Both are equipped with Merrick 24-in. Feedoweights. Screening on two 3x6-ft Symons rod-deck screens with ¼-in. openings follows, with the oversize going to two Marcy 7x10-ft rod mills and the undersize to two 78-in. Akins classifiers operating in closed circuit. Classifier overflows are pumped to four 12-in. cyclones operated in parallel. Underflows of these units return to the rod mills and the overflows containing 60% minus 200 mesh, constitutes the flotation feed.

Following is an average screen analysis:

Plus 65 mesh	9.0%
Minus 65 plus 100 mesh	9.8
Minus 100 plus 200 mesh	20.5
Minus 200 mesh	60.7

Because of the extreme friability of the manganese minerals, as much as 20% of the classifier overflow has been found to be minus 5 microns.

Rod mill discharge contains 50 to 55% solids. Density is held down to avoid overgrinding. The ore is very soft and even breaks down appreciably in the conditioners. Any increase in the fineness of grind means higher reagent consumption. Mineral particles are liberated at about 48 mesh, but there appears to be a tendency for coarse silica to float with the manganese minerals, whereas finer particles do not float as readily. Higher grade of concentrate must be balanced against higher grinding and reagent costs. Due to many fines and bentonite present in the ore, settling in the conventional classifier is less rapid and separation not as sharp as required. The cyclones producing final flotation feed provide additional separation. Cyclone overflow contains 23% solids. Addition of reagent ahead of the conditioners reduces this figure to 19%.

Flotation

Conditioning section of each mill circuit consists of two 8-cell machines and 6 cells of the following rougher machine, or a total of 22 cells. The 16 conditioner cells have 30-hp motors, and each of the six flotation rougher cells used for conditioning has a 15-hp motor. Conditioner capacity in the original plant was 160 hp. in contrast to 1,140 today. Flotation improved with each increase in conditioner capacity. Retention time varies from 15 to 20 min. depending on tonnage treated.

Conditioned pulp enters the rougher flotation circuit at 15% solids. The equipment consists of a 7-cell machine in each mill section. Rougher concentrates produced are cleaned in four cleaner machines, the first made up of 5 cells, the second of 4 cells, and the third and fourth of 3 cells, with an intermediate middling treatment step, as shown in the flowsheet. In the flotation circuit, principal controls are fineness of grind, pulp dilution, and rougher pulp level. There is a consist-

(Continued on p 116)

Background for Manganese, Inc.

THE THREE KIDS MINE, which provides the plant feed, was located in 1917, and output up to shutdown in 1920 both from open pit and underground operations, amounted to about 20,000 tons of ore assaying 40% plus, manganese. Interest in the property was not revived until the mid-1930's, when experiments on the ore indicated a possible recovery of only 70% by flotation.

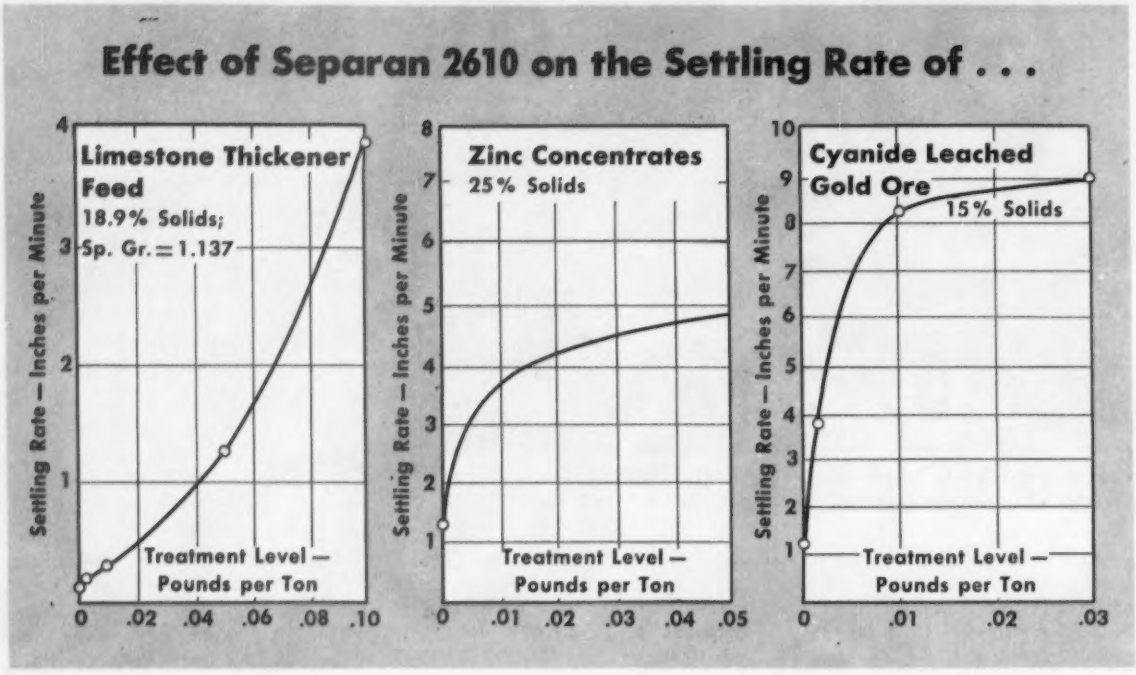
The plant, constructed and operated by the Manganese Ore Co. dufing the late war, was the outgrowth of test and pilot plant work carried out in 1941 by the M. A. Hanna Co. and at the Boulder City Station of the U. S. Bureau of Mines. A limited tonnage of nodules was produced by the SO_2 process. When the manganese supply situation improved in 1944 the plant was again shut down.

Negotiations to acquire the plant were started in 1949, by the late Hewitt S. West. After formation of Manganese, Inc., in 1950, a contract was entered into with GSA to supply the national stockpile with 33-million units of metallurgical grade manganese in the form of nodules. A second contract was made to upgrade some 285,000 tons of stockpiled ore from Manganese Ore Co. operations.

Reconstruction of the plant commenced in June 1951, and operations on a tune-up basis started in September 1952. Capacity of the plant was 1,200 tons per day. Test work upon which the mill flowsheet was founded was done by Robert Lord of Southwestern Engineering Co. and the U. S. Bureau of Mines.

Two major setbacks occurred in 1953, a kiln failure in February and total destruction by fire of the wooden mill building in June, causing temporary shutdown.

Repair of the kiln and replacement of the burned structure with a modern, fire-proof building commenced without delay and normal operating conditions were restored in February 1954. The present flotation plant contains many improvements as to equipment layout and control.


Effect of Separan 2610 on the Settling Rate of . . .
Limestone Thickener Feed
18.9% Solids;
Sp. Gr. = 1.137
Settling Rate — Inches per Minute
Treatment Level — Pounds per Ton
0 .02 .04 .06 .08 .10
Zinc Concentrates
25% Solids
Settling Rate — Inches per Minute
Treatment Level — Pounds per Ton
0 .01 .02 .03 .04 .05
Cyanide Leached Gold Ore
15% Solids
Settling Rate — Inches per Minute
Treatment Level — Pounds per Ton
0 .01 .02 .03

Faster dewatering, better separation, increased capacity and small units in the future point up. . . . . .

How Synthetic Flocculants Help

D. J. PYE
Dow Chemical Co.
Pittsburg, Calif.

DEVELOPED SEVERAL YEARS AGO after an extensive period of research aimed at developing a highly efficient synthetic flocculant, Separan 2610 is used by the mining industry over a wide variety of conditions. While natural flocculants such as starch, glues and gums have been known for some years, they have not been found to be useful in a very wide variety of applications.

Although each ore presents a somewhat different problem due to the variability of natural deposits, results obtained with this reagent have varied from satisfactory to phenomenal in a surprisingly high percentage of cases. There have, of course, been some cases where Separan has not performed in the desired fashion, but number of these cases has been remarkably few.

Since earth-like materials always contain at least some quantities of clay-like materials, and since ores by necessity must be ground very fine, separation of solids from liquid has always presented a serious problem. Suspended solids encountered in beneficiation practically always are slow settling and poor filtering. It is much to the credit of the mining industry and designers of mining equipment that these problems have been resolved through the design and construction of large settling areas for thickening and large area, efficient, continuous filtration equipment.

However, we have felt for some time that although mining operations may appear to have no settling or filtration problems because large-size equipment is available, the problem is still quite real in view of the large capital and operating costs of such equipment. An efficient flocculating agent, such as Separan 2610, has proven so startling to many mill operators that the order of magnitude of their settling problems take on an entirely different character as soon as they see a demonstration of the flocculating powers of such a chemical.

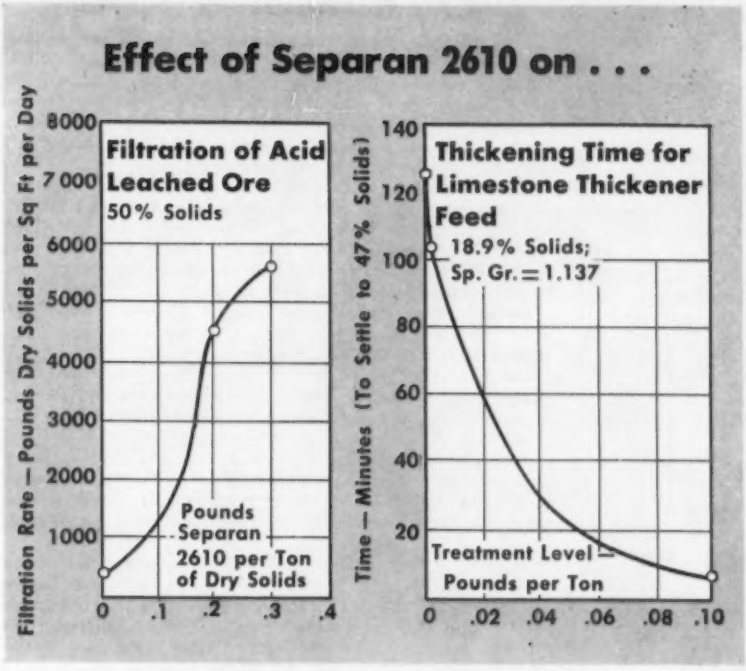
When an operator sees his slow-settling slime, treated with a few hundredths of a pound of chemical per ton of solids, drop like sand in water, he is then struck with a mental picture of his large thickeners, perhaps 150 to 200 feet in diameter, shrinking to a reasonably small unit, yet accomplishing the same production. He also sees this as an answer to a proposed mill expansion without doubling the size of his thickener equipment.

Typical Improvements in Settling Rates With Clear Overflow

Solids	Treatment Level lb per Tons of Solids	Settling Rate (inches per minute) Original	Treated	Improvement Factor
Uranium Slimes	.01	1.25	12.5	10
Copper Concentrates	.05	.11	.49	4.5
Zinc Concentrates	.03	1.82	8.0	4.5
Uranium Ore	.10	.068	1.93	28

Case History No. 1

One uranium ore processor was operating five thickeners, two banks of filters on the underflow from these thickeners, and a final settling of the overflow in several earthen ponds. After the application of Separan 2610



The Mill Operator

to this part of the process, four of the five thickeners were removed and the underflow from the remaining thickener was dense enough so the filters could be completely removed and the earthen ponds were eliminated.

Thus, this entire complex operation was replaced by one single thickener. The reduction in operating costs and improved efficiency resulted in savings of $3,000 per day, which is approximately $1-million a year; for a reagent expenditure of some $15 per day. While this is, of course, an outstanding example, the other Separan users are also reporting gross economies in their processes. Savings are found not only in greater throughputs and reduced operating costs, but also in real improvements in material efficiencies.

Case History No. 2

In one large cement mill which used several 150-ft diameter thickeners, application of Separan quadrupled the capacity of a single thickener at a treatment level of 0.05 pound per ton. During the mill test on this thickener the treatment level was increased still further, which resulted in a most amazing condition in which solids settled so rapidly that entire throughput was completely settled in the 12-ft diameter by 2-ft wide distributor ring in the center of the unit. Water in two-thirds of the perimeter of distribution ring was completely clear with entire solids load dropping through perforations in bottom of the ring in only one-third of the perimetry. In this particular case, initial settling rate of .2 in. per minute was increased to over 80 in. per minute or an improvement factor in settling rate of over 400 fold.

Although these phenomenally large improvement factors are of little practical value in an existing plant they do imply great savings in equipment costs for new plant construction or plant expansion. It is further implied that the nature of the solids is so materially changed that a complete redesign of the thickening equipment should result from the application of such a potent flocculator. Since the improvement in settling characteristics is of course a function of the quantity of reagent added, problems in existing equipment are relatively easily solved at minimal dosage levels. An existing operation which is suffering lack of clarity or lack of settling rate due to increased capacity or a change in character of the ore feed can be easily corrected at nominal cost.

An ore suspension consists of a rather wide mesh-sized distribution in which some sands are present, along with intermediate sizes and extremely fine clay particles or slimes. Action of Separan 2610 is such that fine slimes are flocculated around heavier sand; resulting in a somewhat granular slurry.

Granular nature of slurry has a materially improved filtration rate since filter cake is now porous and the interstices between sand grains are no longer blinded with highly dispersed slimes. Flocculation of slime particles also prevents blinding of filter cloth, permits easier cake discharge, and in many cases materially reduces moisture content of cake.

Case History No. 3

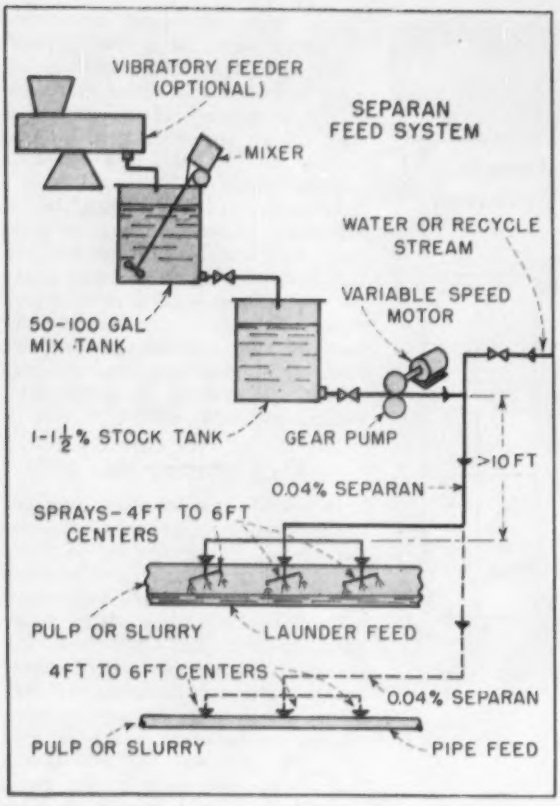
In another case, involving uranium ore filtration, untreated pulp had filtration rate of 300 pounds per sq ft per day on a continuous rotary vacuum filter which discharged a wet, slimy cake (40% moisture). After treatment of filter feed pulp with 0.3 pound of Separan per ton of solids, filtration rate was increased to 5,600 pounds per sq ft per day, and moisture content was decreased to 18%. Whereas initial cake was wet and slimy, treated cake had taken on the character of beach sand, so that the cake was easily discharged and appeared dry and friable.

Case History No. 4

In the case of another uranium operation, low filtration rates limited entire plant capacity to roughly 50% of designed production. Introduction of 0.2 pound of Separan per ton of ore more than doubled filtration rate; resulting in a two-fold increase in entire mill production without change of any existing equipment.

Separan is a non-ionic, water soluble polymer. Due to its non-ionic character, it is effective over a very wide variety of conditions. It has flocculated solids effectively in 60% sulphuric acid, acid leach solutions of pH 1, in neutral solutions, in hot 10% soda ash solutions, and in hot 4% caustic soda solutions. It has also been used successfully in saturated alum liquors and in saturated muriate brines. It is generally successful in flocculating almost all inorganic solids or precipitates such as naturai ores, clays, hydrolytic precipitates, alum flocs, coal and even carbon black.

It is being used commercially with considerable success in settling or filtration of copper, lead, or zinc concentrates and tails, and in production of potash, taconite, uranium (both acid and carbonate leach), tungsten, manganese, barytes, coal, borax, and



How To Test Separan in Your Plant

Reagent comes in dry powder form and should be prepared as a 1 or 1.5% stock solution as follows: Arrange a double propeller portable mixer in a 110-gallon drum containing 70-80 gallons of water so that the bottom propeller is two diameters from bottom of the drum and upper propeller (saw-tooth design) one diameter below the liquid level. Adjust pH to 8 with caustic soda or soda ash.

Feed sufficient powder with the aid of vibrating feeder or hand scoop into the vortex of mixer at a uniform rate over a 5- to 10-minute period. All the powder should be added before the solution becomes viscous. Agitate solution for two hours. 1-1.5% solution at pH 5 to 9 is stable for several months. Highly alkaline solutions degrade reagent.

Stock solution should be diluted to 0.1-0.04%, with fresh water, thickener overflow or filtrate, just before use; at a point at least 10 ft ahead of the filter or thickener.

Small, bronze or stainless steel, variable-speed drive gear pumps can be used to meter out stock solution and diluent. Protect small gear pumps with plenty of 16 mesh wire cloth.

Addition should be made at three points, several feet apart, in feed stream to the thickener or filter. Three stage addition through fan-type spray nozzles makes for uniform reagent distribution and economy. About 0.01 to 0.10 pound per ton dry solids for thickening and 0.05 to 0.50 pound for filtering is sufficient.

Reason for three stage addition is that reagent has strong affinity for inorganic solids and will be adsorbed before flocculation can take place. One point addition results in high reagent consumption (3 times as much) and entirely negative reaction. Lower the reagent strength the more efficient the reaction and the lower the unit cost.

At all times avoid excessive agitation of flocculated pulp. Centrifugal pumps will degrade reagent and require more flocculant to correct situation. Excessive use of reagent at the filter will tend to blind the cloth so don't use it in excess.

soda ash, and in ammonia-leached nickel production.

Quantitative curves on ores indicate the quantitative effect of increasing amount of flocculant on the settling rate. Flocculating effect is proportional to quantity of flocculant added, and the required quantity will, of course, depend upon nature of the particular ore under investigation. While very great improvements in settling rate can be effected by small amounts of flocculant, the size of the flocs ultimately reach a point beyond which they can no longer grow. At this point, further addition of reagent will not increase settling rate proportionally and a saturation point is reached.

Settling rates shown in graphs 1, 2 and 3 are determined in the region of free fall, which is an important factor in design and performance of a thickener. However, the characteristics of underflow solids are equally important, and a good flocculant improves the rate of thickening in the compression zone as shown by graph 4.

In many cases, density of underflow solids is of primary importance to the mill operator and one is often tempted to evaluate ultimate solid density of a flocculated slurry of the basis of laboratory tests in a graduated cylinder. In the case of flocculated solids, this method of test can often be quite misleading. If one observes the nature of settled solids, he will see that flocs still retain their original shape and that water filled voids are plainly visible.

This action indicates that packing fraction of settled flocs is quite low. Since no practical thickener operates under static conditions of a graduate, but rather relies on actions of pickets and rakes to mechanically move underflow solids to discharge point, effect of this rake action on solids must be considered.

Minimum Dosage Best

Slow gentle movement imparted on flocs by rakes acts to partially break down floc structure, and improve packing fraction so that ultimate density of underflow from thickener will, in most cases, be higher than indicated by static laboratory graduate tests. Action of thickener rakes may be simulated in a laboratory graduate by inserting, in the test graduate, a slowly rotating wire rectangle operating at approximately one rpm.

Similarly, filtration rate is also a function of quantity of reagent added as is shown in graph 5. At still higher dosage levels than is indicated on the curve, flocs will be found to have reached a maximum size and strength; and no further increase in filtration rate will be obtained with more reagent. The very large order increase in filtration rate of about ten-fold should be of special interest to the designer of new mill installations; since very material decreases in capital expenditure and operating costs can be realized with the proper and judicious use of Separan.

Chemical nature of some polyelectrolytes is such that excessive amounts of reagent cause redispersion of flocs to such an extent that same compound can be used as a dispersant as well as flocculant, depending on the quantities applied. Separan, however, does not fall into this category, and excessive amounts do not cause redispersion. However, in the case of filtration, excessively large amounts of Separan have been found in some cases to effect the properties of filter cloth so that a decrease in filtration rate will be observed due to cloth blinding.

When proper amount of Separan is used, this is not encountered and cloth blinding caused by very fine suspended particles is usually completely eliminated; resulting in a decrease in costs of cloth maintenance and increase in cloth life in addition to an increase in productivity.

SUCCESSFUL MINERS take a break at the headframe of their first underground mine. Larry Malone, 13, (left) has saved the most money. Philip Cote, 14, joined the Malone boys in 1951. Bruce Malone, 15, has been mining longest.

Teen Agers Mine Tungsten For a Profit

BILL RINTOUL
E&MJ Correspondent

AMONG RECENT CHECKS issued by Surcease Mining Co. in the Atolia mining district of California's Mojave Desert were those made out to Bruce and Larry Malone of Atolia and Philip Cote of Red Mountain.

More impressive than the amount of the checks, which came to $249.20 for the three partners' share of gross value of tungsten ore which they had mined and Surcease had milled, were facts which did not appear on either the checks or the settlement sheet which accompanied them.

All three of the mining partners are still teenagers. All are high school students—Bruce is a sophomore and Larry and Philip are freshmen. At 15, Bruce is the oldest of the three. Philip is 14, Larry is 13.

In the past six years, with a negligible amount of help from other youngsters, the three boys have mined 11.85 tons of scheelite for a gross value of $3,761.30. Their share of the gross, based on a 50-50 split with Surcease Mining Co., owner of the tungsten claims, has added up to $1,880.65—enough to imbue the boys with plenty of spirit for further mining ventures.

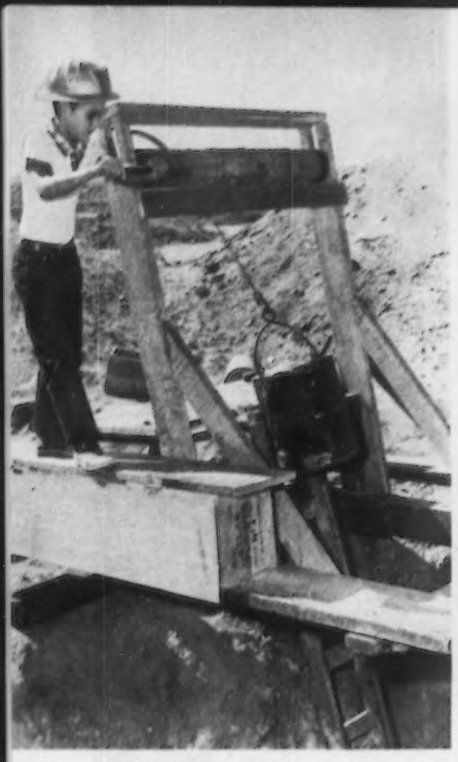
Mining operations were started by the Malone brothers in 1949, two years after the Malone family moved to Atolia.

Their father, Kevin Malone, is a mining engineer with 20 years' experience in the mining profession. Before

What The Boys Have Done

Year	Tons	Gross[1]	Individual Pay	Partners
1955	1.5	$498.39	$83.06	Bruce & Larry Malone, Philip Cote
1954	2.0	537.14	89.52	" " "
1954	1.25	528.57	88.10	" " "
1953	1.00	788.44	197.11	Bruce & Larry
1953[2]	1.00	381.92	47.74	Bruce & Larry, Philip, Joe Messner[3]
1952	1.00	45.36	7.56	Bruce & Larry, Philip
1952	1.00	86.24	10.78	Bruce & Larry, Philip, Ray Lux[4]
1951	0.60	150.00	15.00	Bruce & Larry, Philip, Eugene & Charles Kennedy[5]
1951	0.50	201.96	33.66	Bruce & Larry, Philip
1951	—	166.52	41.63	Bruce & Larry
1950	—	128.80	64.40	Bruce
1949	2.0	207.68	34.61	Bruce & Larry, Tommy Moyer[6]
1949	—	21.76	5.44	Bruce & Larry
1949	—	18.52	4.63	Bruce & Larry
	11.85	$3761.30	$723.24[7]	

Notes:
1. According to terms of leases, 50% to Surcease, 50% to lessees.
2. Boys began underground work.
3. Summer visitor from Pacific Grove, Calif., 15 years old at time.
4. Summer visitor from Sacramento, Malone boys' cousin, 12 at time.
5. School friends from Randsburg, about 13 or 14 years old at time.
6. Son of assistant manager of Surcease Mining Co., 14 at time.
7. Bruce Malone earned $723.24; Larry earned $658.84; Philip earned $375.42



OPERATION is simple, says Bruce: "one mucks, one hoists, one dumps the barrel." Here, Philip takes his turn at the winch.

LARRY AND PHILIP take a turn underground with the jackhammer. "About five hoses broke at first," says Bruce.

TAKING TURNS, Larry heads topside. Boys usually work for an hour or so, "and then we take off for a swim."

the family moved to Atolia, he had worked in hydraulic mining at Scott's Bar and Oroville, Calif., with time out during World War II for service in bomb disposal and demolition work with a Marine air group.

Far from finding their new home dull, Bruce and Larry were fascinated by their surroundings at Atolia, a small mining camp near Randsburg and Johannesburg in the Mojave desert. One of their early games involved playing at mining. On the hillside in back of their house, they dug holes and built windlasses like those used by the miners.

"Some of the holes were over their heads," their mother, Grace Malone, recalls now. "They really worked hard trying to dig into the ground. They used to borrow their father's Miner-alight to look for ore at night."

Watching them work, the boy's father made a decision. "If they're going to work at it so hard," he told their mother, "they might as well get something out of it."

A regular lease was drawn up with Surcease Mining Co., owner of the Atolia tungsten claims. Though Kevin Malone was general manager for Surcease at the time, the lease was made through the normal channels

GRACE MALONE, with her three hardrock miners, developed a philosophy. "I figured the less I knew, the better off I was." Dad's a mining engineer.

MARGIE AND PATTY MALONE admire Bruce's lapidary set, purchased with the income from the mine, split 50-50 with Surcease Mining Co.

by which the mining company leases claims to prospective miners.

That was in 1949.

Bruce and Larry Malone have been part-time miners ever since. In 1953 they graduated from surface work to underground work. Except for an occasional assist from a school chum or summer visitor, they have had only one real partner, Philip Cote, a school friend, who joined them in 1951.

Size of their leases has run slightly smaller than those of the adult miners —100x50 ft as compared with 200x50 ft for the average adult lease. Terms of the leases have been the same. Lessees mine the ore, Surcease Mining Co. mills and sells it. Gross receipts are equally divided between lessees and the mining company.

Frank Baby Helped

Frank Baby, engineer in charge of the Surcease leasing program, supervised operations on the teenagers' claims as well as on 70 other leases.

Supervision by Frank Baby was never an onerous affair for the boys.

"He used to come around and see how we were making out," Bruce Malone says. The teenagers single-jacked until a year ago, when Kevin Malone bought them a Thor 28 jackhammer. "Mr. Baby used to help us get the jackhammer running," Bruce adds. "We had a lot of trouble with the hose at first. About five hoses broke." They were old ones from gold mining operations at Oroville in the mid '30s. "We finally solved our problems by getting new hoses."

As an indication of the kind of a job the boys have done, let's look at a typical settlement sheet:

Malone — Cote — Malone

Lot 763: 1½ tons milled

Tables:

248# @ 63.80%=158.22# WO_3
or 7.911 units @ $63.00=$498.39

Settlement (50% to lessees)	$249.20
No deductions	
Larry Malone —	$ 83.06
Philip Cote —	$ 83.07
Bruce Malone —	$ 83.07

Lode—Central

5.26% ore

High grade of the ore—higher than a lot of mine concentrate—and the fact that they only took one and one-half tons out to be milled, leaving some 30 tons of waste, attested to the good, clean job of mining the three boys were doing.

Mining has been strictly a part-time job for the boys. They work when the spirit moves them—mostly on Saturdays or during summer vacations from Randsburg High School. They have located the ore themselves and have worked about 20 holes, ranging in depth from five to twenty-five feet. To some they have given such names as Bulldog, Moonstone, Goldstone, Blackbird, and Blue Diamond. The last they named the Midway. Others they have not bothered to name.

Their method of operation is simple. "One of us mucks, one hoists, one dumps the barrel," Bruce Malone says. As the oldest, Bruce usually says when it is time to trade off. "We usually trade after about four or five buckets." Apparently they have worked together without friction. "There's never been any argument when I said it was time to change over," Bruce says.

At night the boys go over the rock with a Mineralight to pick out the ore that is worth keeping. "On the last hole we didn't have to use the light much," Bruce says. "We could usually tell which was the ore worth keeping. We could usually see the vein going through it, and it was pretty heavy too."

Experience has taught them to timber a mine, how to follow a vein, how to operate a jackhammer, and, according to 13-year-old Larry Malone, "how to make money."

Bruce's One Miss

At first Kevin Malone did the blasting for the boys. About a year ago he taught Bruce the secrets of blasting and Bruce has been doing the job ever since. "I've only had one miss," Bruce says. "It was in the Moonstone. There was water in the hole."

"We had a lot to learn," Bruce says in reviewing their mine experiences. The boys had a tough time learning how to collar a mine. "The first time, it fell out," Bruce says. A second time blasting knocked the collaring out of their mine.

"Phil's mother and I worried plenty," Grace Malone says. "Especially when some of the holes went down deep. I always figured the less I knew, the better off I was. I'd ask them if they'd been down any deep holes. They'd shake their heads and I wouldn't ask any more questions. Their dads figured they could take care of themselves."

Once, in the Moonstone, the windlass broke and Larry, working a drift, was struck on the knee. At the time, the Malone boys' aunt was taking care of them while Kevin and Grace were attending a mining convention in Seattle. The boys prevailed upon the aunt not to mention the mishap, and mining went on as usual.

Like all good miners, they have learned to improvise, too. A good example are the hard hats they wear. They were originally surface hats until the boys screwed a framework onto them making it possible to install regular carbide lamps on the hats.

Mining has not interfered with other things the boys like to do. A typical work day in the summer consists of "an hour or an hour and a half" in the mine, after which they "take off for a swim."

The "swimming pool" is an old thickener tank about 40 ft across and 12 ft deep which has been converted to a pool. "All three of the boys learned to swim in the desert," Kevin Malone says proudly. "They're all fine swimmers. We've had boys visit us from Sacramento and Pacific Grove on the coast who hadn't learned to swim yet. They had to learn to swim out here on the desert."

In school Bruce found time to play high school football, basketball and track. Larry and Philip played on a Little League baseball team last summer, while Bruce played on a community softball team.

While the boys have spent some of their money on family vacations at Santa Cruz and to buy things they wanted, like a chemistry set and a lapidary set, they have banked most of it.

Larry, youngest of the three, has the most money — even more than Bruce, who has worked in the mine more consistently than his partners. "Bruce bought some stock," his father explains with a smile. "You should have seen him then. For the first six months, he used to pick up the paper and look right away at the financial page. He still does part of the time."

Philip Cote also has considered buying stock, though he has not taken any action yet. His preference at the moment is for California Electric Power Co. His father, Irvy Cote, is manager for the company in Red Mountain.

Earmarked for School

Mostly the boys figure their money in the bank is earmarked for higher education when they finish high school. Larry plans to study forestry. He is interested in nature, particularly in desert birds. Near his house he built dams to catch leaking reservoir water for the birds. Sparrows, quail, dove, cactus wrens, hawks, buzzards and owls are a few of the kinds he has identified at the water holes.

Philip wants to be a scientist. Like Larry, he has not picked the college he wants to attend. Of the three, only Bruce plans to follow the mining profession.

If the boys follow through with the ambition and ability they have shown in their mining operations, it seems certain they will all be heard of again.

TYPICAL LAS VEGAS atmosphere pervaded the various informal get-togethers but failed to cut down attendance at the crowded sessions. A few members even reported breaking even after frequent visits to the city's principal profit-making industry.

AMC Tackles the Mobilization Base

WHAT DO YOU THINK of Las Vegas as a convention town for the American Mining Congress? Nine times out of ten the answer is sure to be "fabulous." Spot queries aimed at departing convention goers added up to this: "The sessions were good", "We sure had fun" and a few even volunteered "We quit when we were ahead!"

Howard I. Young, president of AMC, termed it as "one of the most successful in attendance since I have been president" (22 years)—more than 3200 people turned out for the Oct. 10-13 event.

L. J. Randall, national chairman of the program committee, credited the outstanding success of the various sessions to about 250 mining men from all over the nation who served on his committee, and to the AMC headquarters staff which boiled down committee suggestions into an 80-page report on what the mining industry wanted to learn at the 1955 AMC Las Vegas convention.

Sessions were jammed. If you didn't come early, you had to stand. In some cases the members stood out in the hallways straining an ear to catch what was being said in the meeting room around the corner. More than 200 manufacturers under the chairmanship of J. W. Overstreet contributed their support to the technical sessions.

Mining journalists covering the convention got together at the close, and asked "What's the general pitch of this meeting?" It was agreed that the term used most often by speakers was "mobilization base" which referred to the adequacy of the mining industry to supply necessary minerals and metals in event of an attack on the U.S. or participation of the U.S. in a war to defend democracy, or to forestall an attack because of strength of the democratic nations.

Douglas McKay, Secretary of the Interior, touched on the subject when he told miners "Your production for peace and war could swing the balance . . . to build a just and enduring peace."

Arthur S. Flemming, director of defense mobilization, picked up this theme by referring to President Eisenhower's remarks that we are living in a chronic "age of peril" in which the U.S. must build a strong "mobilization base" which will prepare us for attacks on continental U.S. In reviewing the present stockpiling program he reported that all but 22 of the 224 expansion goals have been met. Since requirement pictures can change rapidly, he assured the audience that gaps now closed may have to be reconsidered. However, he cautioned the mining industry not to expect defense authorities to use their powers to stabilize non-defense aspects of the industry.

In a stockpile session, chairmanned by A. E. Millar, manager of Anaconda's Yerington plant, he summarized the intense interest in the session with the statement "That where there is no vision, the people perish." Keynote speaker of the session, Felix Wormser, Assistant Secretary of the Interior for Mineral Resources said that the Government has the obligation to assure development of mineral resources in a sound manner to establish an effective mobilization base." Stockpiling has been a key factor in this program, Mr. Wormser pointed out, but he warned the audience that security measures cannot be used as a "stabilization tool" and that the "stockpile is not a bottomless pit." He introduced Spencer Shannon, new head of the Office of Minerals Mobilization and reported that advisory committees covering 14 commodities have already been organized under OMM.

Mr. Wormser said that despite lip service given to the cause of "free enterprise", the minute consumers face temporary shortages, they demand export controls of copper, steel and aluminum scrap to protect their supplies. "If controls should be used to benefit the consumer" he observed that it would only be fair to use controls to "benefit the producer." But the economic facts of life are that the consumers outnumber the producers. Although consumers have the last word Mr. Wormser concluded, any truly free enterprise system "cannot stand Government tampering with markets."

You couldn't listen to the balance of the program on stockpiling and government mineral programs without being depressed on the outlook. H. S. West, Jr., of Manganese, Inc., showed that Eisenhower's veto of H.R.6373 had all but scuttled a domestic manganese program. Fay Bristol argued that producers could supply 15 to 20% of our chrome needs if properly protected, but that uranium mining had siphoned off the dwindling number of producers of chrome. James Bradley, of Bradley Mining Co., said domestic

JUSTLY PROUD of the successful meeting were Mr. and Mrs. Julian Conover and president and Mrs. Howard I. Young, of the American Mining Congress.

JUST TALKIN' at the barbecue are Lt Gov. Rex Bell and Charlie Steen.

production of antimony had fallen off to 7% of our normal peacetime needs and only 2% of our wartime needs. He showed that we are now dependent on foreign sources which could dry up quickly in an emergency.

Sam Williston told the audience that the outlook of producers of strategic minerals is "increasingly discouraging." He stated that if the tariffs of 1939 were in effect today there would be no problem, but the reduction from a 40% level at that time to a level "uniformly below 10% today" was the cause of many industry headaches. He concluded that although Washington was the cause of all these problems, "regrettably as it may seem", the cure must come from Washington.

Andrew Fletcher, president of St. Joseph Lead Co. cited statistics to show that domestic production of lead and zinc has "not been materially increased since 1950." He concluded that the best solution to offset increased cost of production for lead, zinc and other similarly situated domestic metals is a "moderate stockpiling program when production is in excess of consumption, coupled with a modern increase in tariff or an excise import tax as in the case of copper, that would be suspended whenever the price was sufficient to permit the domestic industry to survive."

Reviewing the overall proposals of the convention one could find no universal cure-all for the problems of the mining industry. The spectrum of solutions ranged all the way from high protective tariffs, tax relief, import quotas, virtual subsidies, to stockpiling—the latter being quite bluntly appraised as "a prop" which would do the over-all industry no good.

On the subject of tariffs, V. C. Wansbrough, executive director of the Canadian Metal Mining Association distinguished himself as a good minerals diplomat by tactfully reminding the AMC audience that measures taken "to regulate trade by 'either of our countries' (Canada and the U.S.) should be such as to achieve the desired result without sacrificing something far more valuable than lead and zinc, namely, harmonius and cooperative development of the mining industries and the marketing of mining products on the North American continent."

One observer who had previously listened to strong protectionist appeals of American producers observed "Wansbrough was stepping on eggs, but he didn't crush a single one."—Other listeners, appreciating the delicate matter he had to present, said he "stole the show" at his session. With the million of dollars in investment now going into Canada, one can only conclude that the voice of our friendly neighbor to the north deserves representation in domestic mining meetings.

The session on "Outlook for the Mineral Industries" chairmanned by L. J. Randall was decidedly more optimistic. Joe Gillson covering some 100 industrial minerals in about 20 minutes concluded that "this field is exploding in new developments."

Charles R. Ince, vice president of St. Joseph Lead Co., presented a crisp outlook for copper, lead and zinc. He stressed the importance of "price stability" in capturing and holding new markets for the metals, and outlined the objectives of achieving a domestic price which will permit profitable production without discouraging demand.

He predicted a good consumption rate for copper but observed that producers are not "too unhappy" about the recent weakening of copper prices, because of the threat of competition. Although the per capita consumption of lead is steadily dropping. Mr. Ince showed that the outlook "for lead is quite healthy."

Zinc is in a strong position, he said, because zinc consumption for galvanizing is currently running 15% ahead of last year's rate, and the die casting industry is consuming 48% more than for last year.

But despite the encouraging outlook for these three primary non-ferrous metals, Mr. Ince stressed the "need for research and promotion to expand the markets" for these metals.

A. L. Fairley, Jr., vice president and general manager of Snyder Mining Co., Pittsburgh, Pa. said steel makers are predicting an expansion of as much as 40-million tons of ingot capacity in the next ten years over our present 125-million-ton ingot capacity. Despite minor inroads of plastics and other metals, he said "nothing has yet been found which can economically replace steel in the over-all needs of the world economy. And as steel goes, so moves the iron ore industry."

F. D. DeVaney, chief metallurgist of Pickands, Mather & Co., led a session on metallurgy which provoked considerable comment from the floor on the subject of cyclones.

Lyle M. Barker, manager of the Phelps-Dodge Morenci branch, presented a staff paper showing effective performance of 20- and 30-in. cyclones replacing classifiers in test work in the regrind section of the mill, and 30-in. cyclones in the primary grinding section. Cyclone wear constituted one of P-D's chief problems. He said the plant would now insert a classifier in circuit with the cyclone to scalp

ROGER PIERCE showed what's new with slides of shaft mucker, rotary drill, multiple car loaders.

DON EVERHART: "Uranium exploration and development throughout the world . . . is a young business."

MILES ROMNEY: "Areas where poor ventilation permits radon gas buildup must be checked constantly."

off coarser products. Test work is continuing at Morenci.

S. J. McCarroll, general superintendent of Manganese, Inc., Henderson, noted that cyclones perform the multiple functions of grinding, classifying, mixing, dewatering, and dispersing—the latter being very important at his plant where unwanted agglomeration of fine particles takes place.

Earl Herkenhoff, metallurgist of Pickands Mather, explained the following variables which must be controlled in good cyclone operation: pulp density, diameter of apex or underflow opening, diameter of vortex finder, included angle of conical section, feed pressure, feed nozzle area, height of cylindrical section, back pressure of overflow conduct.

"Cyclones have found a definite place in the iron ore industry" observed I. J. Erck, chief metallurgist, Cleveland-Cliffs Iron Ore Co. He presented graphs showing how the rise of viscosity in cyclone circuits could nullify performance efficiency.

Comment from the floor started with Norman Weiss who showed that the detail of tangential design of the feed nozzle can be quite critical and effect performance and efficiency of the unit markedly.

Jack Myers, consultant for Denver Equipment Co., pointed out the necessity of considering the economics of cyclone performance as well as the physical performance. He suggested that there may be certain economic cut-offs for the unit, for instance: under 65 mesh cyclones are not economical; between 65 and 100 mesh, a borderline zone; above 100 mesh cyclones prove best.

Frank McQuiston concluded the session with a description and unusually practical analysis of the problems involved in modernization of Newmont Mining Corp.'s Pandora mill at Telluride. Capacity is 30,000 tons per month with provision for expansion to 40,000 tons per month.

Operating cost distribution for the mill is estimated as follows: Labor, 15.6%; reagents 14.8%; supplies 54.7%; power (20.5 kwh per ton) 14.9%. Total cost of modernization was estimated at $765 per ton day for the 1000 tpd mill; for an additional 8%, capacity was increased 40%. The additional capacity between 1,000 and 1,400 tpd cost approximately $150 per ton day.

G. R. "Buffalo" Kennedy lived up to his rugged western nickname by saying that newspaper articles on fusion, energy, thorium reactors, and lithium had "scared the hell out of me." He brought the issue "What's going to happen to uranium miners after 1962?" right out into the open and cited a firm need for the AEC to issue a statement to "restore and bolster the confidence of everyone concerned in the future of the domestic uranium industry."

A. J. Eardley, dean of the College of Mines and Mineral Industries, University of Utah, Salt Lake City, estimates that our stockpile in terms of tons of natural uranium metal (in untreated ore, or natural or enriched uranium) would be about 32,000 tons to the end of 1955 and 132,000 tons to the end of 1965 (in both cases minus amounts used in bombs and experiments.)

Clyde Osborn, general superintendent, Navajo Uranium Division, Kerr-McGee Oil Industries, Inc. outlined operating problems of a new uranium mill. These included recruiting and training personnel, methods of drying yellow filter cake (steam tables proved no good), corrosion problems, abrasion problems, and wide temperature variations during the year.

Paul Henshaw, exploration geologist, Homestake Mining Co., showed that there would be available an ore reserve very handsome in grade and tonnage for any uranium extraction plant located reasonably near the Big Indian area "provided the plant is designed around a no-penalty (lime) process."

Sheldon Wimpfen, AEC's Grand Junction manager, reported that during August 1955 uranium ores were being milled at a rate of 375% above the 1952 milling rate, and predicted that the increase would be 525% by the beginning of 1956.

Phillip L. Merritt, senior geologist, E. J. Longyear Co., chairmanned a uranium exploration session in which he commented that "uranium exploration has to move ahead if we plan to keep the present and future mills going."

Donald Everhart, geologic advisor, U. S. Atomic Energy Commission, reviewed the world occurrences of uranium minerals and concluded "uranium exploration and development throughout the world . . . is still a very young business."

R. D. Lynn, geologist, Anaconda Co., Grants, N.M., reported that three types of drills have been used for exploration: diamond core drills, rotary drills, and percussion wagon drills. Although each type has a particular place in exploration he said, "the diamond core drill has been most versatile and reliable, particularly when samples are required."

Sales contracts totalling $444,160,000 have been let and one mine is already producing in the Blind River area of Ontario, according to E. B. Gillanders who summarized activities in the Blind River area.

Miles P. Romney, manager, Utah Mining Association summarized Utah's code to combat possible radon gas

A. E. MILLAR summed up the keynote of the convention; "Where there is no vision, the people perish."

SIM CLARKE: "More holes must be drilled with air-leg units in production to equal work done by drifters."

SAM WILLISTON: "If the tariffs of 1939 were in effect today, strategic mineral producers would face no problem."

hazards in uranium mines. Chief problem he cited is the need for constant checking of areas where ventilation might not be adequate to stop a build-up of radon concentration.

Romney's paper paralleled one by Otto Wiesley, chairman, Utah State Industrial Commission, which concluded that all operators should make an effort to keep the radon concentration below 300 micro mille curies per liter (MMCL). A unit to monitor mines effectively costs about $400. It was suggested that four or five small mines could easily get along with one unit.

Paper prepared on mechanized mining on the Colorado Plateau by Harold Spencer, Centennial Development Co., Eureka, Utah; and Virgil Bilyeu, Utex Exploration Co., (delivered by Harold Helburn) revealed that modern equipment in use includes the Gismo with piggy-back trolley haulage, slusher units on inclined drifts, diesel locomotives, shuttle cars, coal-type loaders, tractor type loaders of both overshot and front end type, front-end dump trucks, long-sash drilling equipment on jumbos, and extensive roof bolting. The Gismo unit at Standard Uranium produces about 350 tpd. Output per normal shift at Mi Vida is 22 tons; at La Salle mining, 12 tons; at White Canyon, 15 tons.

H. O. Seigel's paper on the exploration work that led to discovery of four large lead-zinc-copper orebodies, two containing more than 25-million tons, in the Bathurst-Newcastle area of New Brunswick, Canada, was read by Earl Gillanders. Graphic examples of the results obtained by various geophysical methods and geochemical soil sampling over the orebodies discovered, and certain conductors of graphitic origin were shown.

Colorimetric, emission spectrographic, polorographic, x-ray spectrographic, and paper chromatographic methods for prospecting were explained by H. W. Lakin, who revealed that USGS has developed colorimetric methods applicable to geochemical exploration for 20 elements. A mobile unit for emission spectrographic work has proved useful in the Tintic district of Utah. Paper chromatography has been applied to prospecting for uranium, and a modified version set up for use in soils and rocks on the Colorado Plateau. A simple field method for the determination of uranium in natural water is being tested.

N. R. Mukherjee described a colorimetric field method for analysis of minute quantities of metallic elements in soil near the surface for establishing a pattern of the anomalous values to give a clue regarding location of the orebody, using white gasoline and high-pressure appliance fuels in conjunction with sodium chloride. A brief report on observations on Geobotanical prospecting in the Grants area of New Mexico, using Rattler Weed with a high selenium content as indicator, was given by T. O. Evans.

W. R. Van Voorhis discussed the work done by an operations research team composed of the operations research group of the Case Institute of Technology and personnel of the Hanna Coal and Ore Corp. to estimate the nickel content of an orebody located at Riddle, Ore.

Data for the study were taken from drilling information, and statistical procedures were used in the analysis, leading to a study of the relationship between cut-offs in the orebody and the expected mean grade of nickel above different cut-offs. The company had made estimates based on drilling data and geological evidence, but had no measure of the reliability of estimated yield. The team estimated from the available evidence the nickel content for various levels of mining, and placed probability confidence limits on these estimates.

Necessity of developing a program of intensified study of surface and underground water resources and formulating plans for their fullest utilization was recommended by H. A. Shambergar to assure an adequate water supply for the arid west in years to come.

S. S. Clarke discussed usefulness of airleg drills in the Tri-State field in specific operations such as prospecting bright spots, driving raises, etc., but noted that general drilling continues to be done with jumbo-mounted drifters. Percentage use ratio 15 : 3.7 : 96.3 respectively. More holes must be drilled with airleg units in production drilling to equal the work done by drifters. If a complete change-over to airlegs were made in the mines of Eagle-Picher Co., he said, more than 100 additional units would have to be used, necessitating larger compressor and repair facilities.

Introduction of airleg drills in horizontal development work at Kerr-Addison Gold Mines, Ontario, produced a sharp increase in rate of development heading advance, use of standardized drilling equipment, preference over conventional drifters by miners, reduction in powder consumption per foot of advance, and added economy in that it is no longer necessary to find work for the mucking crew for part of a shift, according to J. L. Ramsell.

Prior to 1953, development drifting was done by 2-column mounted drifters with two men drilling and blasting a round in an 8½ x 8½ ft heading on one shift, and a 2-man mucking crew cleaning out the round on the next shift; average advance per round was 8½ ft. With airleg units the com-

(Continued on p 206)

Automation Creates Jobs For Workers With Skills

There is new and reassuring information for those who fear that "automation" — the control of machines by machines — will mean fewer job opportunities. It comes from a special survey of 1,574 companies in metalworking industries recently completed by AMERICAN MACHINIST, a McGraw-Hill publication. More than one-fifth of the companies reported that they already have automatic loading, transfer or assembly machinery in operation. In these companies as a whole there has been a net increase in total employment since this machinery was installed.

According to the AMERICAN MACHINIST survey, of these companies with actual experience in automation

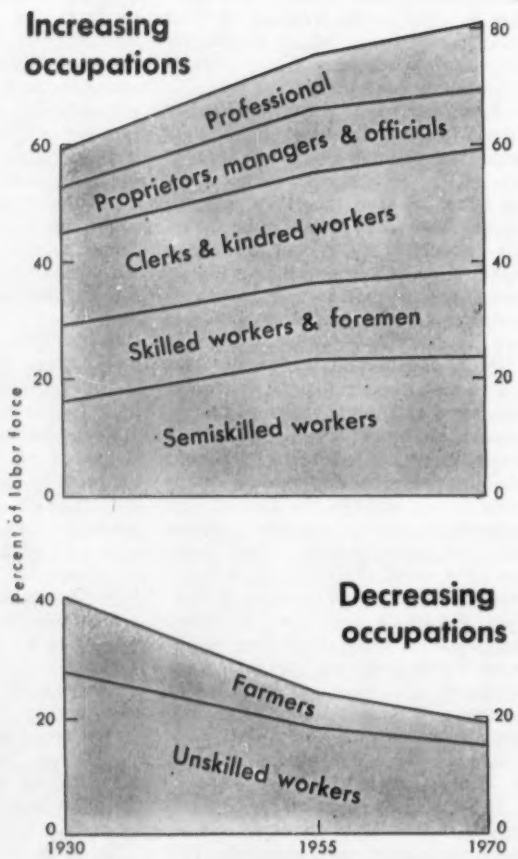
- 26% reported increases in employment averaging 21%
- 51% reported no change in total employment
- 23% reported decreases in employment averaging 16%

More Jobs for the Skilled

Of greater significance, however, is the response by 40% of these companies that they required more skilled maintenance men and by 21% of the companies that they had increased their engineering staffs. This indicates that automation is strengthening a trend already evident in the United States, a trend of expanding opportunity for those with industrial and professional skills and, relatively, of contracting opportunity for the unskilled.

The following chart shows how strong this trend has been over the past 25 years and how strong it may be expected to be over the next 15 years.

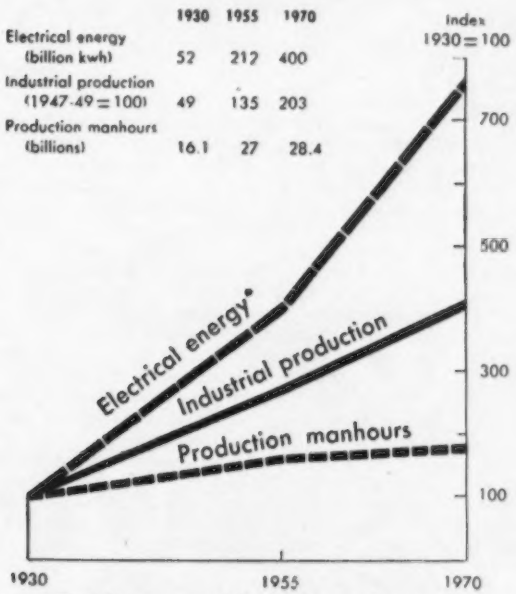
There has been a sharp decline in the percentage of unskilled workers in the nation's labor force and a corresponding increase in the percentage of those with varying degrees of skill.



It is possible, of course, to cite cases of individuals and groups that do not conform to the charted trends. Farmers, for example, are becoming at the same time more skilled and less numerous. But this does not upset the broad proposition that opportunities are increasing for those who have skills.

Power and Production

Much of the basic explanation for the relative expansion of opportunities for those with industrial and professional skills lies in the increasing use of power-driven machinery. This has made possible a vastly greater increase in manufacturing production than in the manhours of human labor devoted to it. The following chart shows the relative increases in electrical energy and manhours of labor used in manufacturing since 1930 and the rise in industrial production.

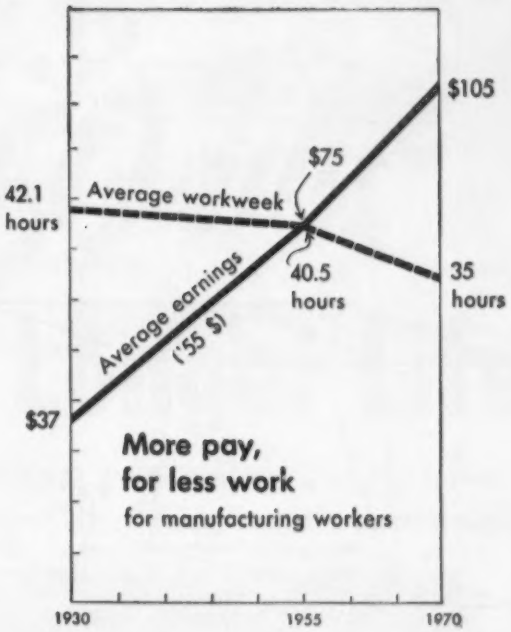


*Excludes power used in aluminum and magnesium reduction, both very heavy power users.

Power-driven machines have reduced the amount of human energy required for physical labor, but they have increased the need for skillful handling and maintenance. As the AMERICAN MACHINIST survey demonstrates, the same is true of automatically controlled machinery.

Higher Wages, More Leisure

The rising average wage of American industrial workers and the decline in hours per week that they must work reflect directly the extent to which the increase in industrial production has outstripped the manhours devoted to it. The final chart shows the increase in weekly wages (in dollars of constant purchasing power) and the decrease in the average workweek in manufacturing since 1930. It also shows the changes that may come in the next 15 years if present trends continue.



There are some who would slow what an earlier editorial in this series characterized as "the continuing process of taking dull and laborious work off the backs and minds of men and transferring it to machines operating in large batteries under automatic control." In doing so, they might make the world safer for those with no skill. The far more constructive course is to welcome the expanding opportunities now being provided and be sure that the nation's young people, who are now starting another school year, are prepared to take advantage of them.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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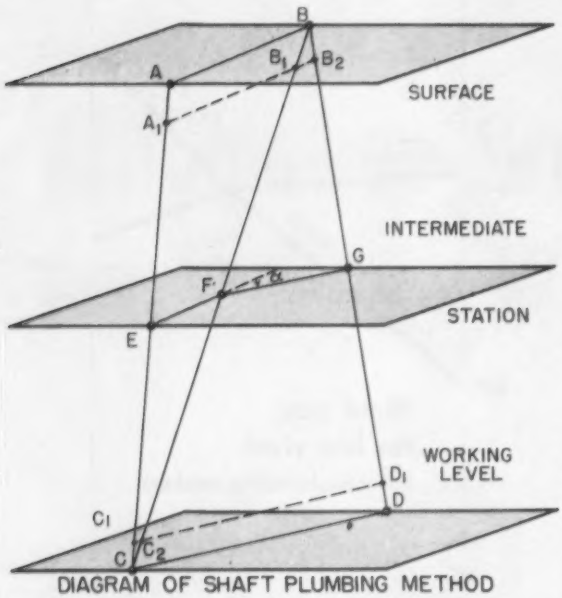
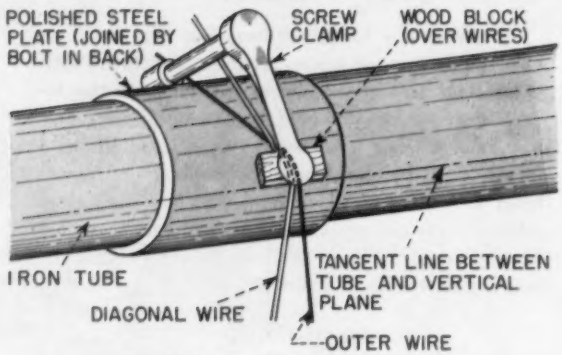


DIAGRAM OF SHAFT PLUMBING METHOD



MEANS OF ANCHORING WIRES

How To Plumb Shafts Faster

TIME CONSUMING JOB of transferring azimuth down shaft is cut with new, more precise method devised by Kauno Kangas, mine surveyor, Luossavaara-Kiirunavaara AB, Malmberget, Sweden. Worked out by him at Royal Institute of Technology in Stockholm, principle is shown in illustration. AC and BD are two wires as plumb as is conveniently possible, and anchored at their lower ends as well as upper. Between B and C a diagonal wire is stretched. Wires AC and BC now form a plane in which all horizontal lines are parallel, even if plane is not vertical. Analogous relation is valid for figure CBD. Bearing of CD is obtained by adding known bearing of AB and angle α, measured on an intermediate level. Note that outer wires do not have to be plumb as in other methods.

In order to understand advantages of new method, sources of errors with usual methods based on freely hanging plumb lines are analysed first. Accidental errors partially depend on imperfections of instruments, equipment, etc., but mostly on often troublesome swinging of plumb bobs that makes sighting as well as measuring of length to and between wires more difficult. Cumulative errors, much more dangerous than accidental errors, mostly depend on: turbulent air currents in shaft; magnetic attraction on plumb wires (and iron plumbs); divergent gravitation on different plumbs; cumulative instrument errors.

Errors Analyzed

For new method, examining accidental errors first, there are no swingings at all in upper and lower end of wires, and therefore sightings can be performed rapidly and with extreme accuracy. When measuring angle α, little swings (vibrations) appear, but these are only a fraction of those of a plumb wire hanging freely and just as long. As to dangerous cumulative errors, especially turbulent air currents, it appears that symmetrical currents do not have any effect. Outer wires are certainly displaced on intermediate level but in equal and opposite directions. And although upper part of diagonal wire is pressed a little to right and lower part to left, midpoint is unaltered. Result is that angle α remains unaltered. Also with unsymmetrical air currents, error usually turns out to be less than with old methods, for a plumb wire fastened at upper as well as lower end shows greatest displacement in the middle and is moved only ¼ as much as the lower end of a plumb wire freely hanging and just as long. Same is applicable to magnetic tractions. And there can be no divergent gravitation on plumbs since no free plumbs are used.

Bending of the wires along chain-line may be supposed to be source of error if wires do not hang vertically (as always being the case with diagonal wire), but theoretical investigations show it is negligible if all three wires are stretched with same stress. A completely new cumulative error appears, however, that is not to be found when using old methods and which is caused by fact that it is practically impossible to make diagonal wire coincide exactly with outer wires at points B and C. In order to have wires coincide as near as possible in practice, all three wires above ground must lie exactly along same line, AB, and wires underground along another line, CD. If outer wires AC and BD then hang vertically new cumulative error will have no effect at all. But if lower end of outer wire deviates from vertical plane through AB, there will be a small cumulative error. For example with outer wires 2 m apart, wire 0.6 mm in diameter, it is calculated that a deviation of 8.3 mm is needed at the lower end of outer wires in order to make the cumulative error come up to 1 second. This accuracy can probably be kept even in shaft plumbings with depth up to 1 km, if work is carefully done, according to Mr. Kangas.

In order to find out if method is insensible to deviations of outer wires from vertical line in practice too. Mr. Kangas has done a double plumbing in which first plumbing was done with as vertical outer wires as possible. Before second plumbing, lower end of outer wires were moved aside purposely, one of them 8 mm and the other 77 mm. Difference between the two plumbings was only 17 seconds. Shaft depth was 200 meters.

Some Practical Advice

Mr. Kangas feels it may not be out of place to give some practical advice to mine surveyors who are interested. As mentioned before all three wires must lie along same line. For this purpose a straight iron tube 2 to 3 in. in diameter will be suitable. On it, high-luster polished, rustless steel-plates, about 1 dm wide, 0.8-1.0 mm thick, and long enough to wrap around the tube, and bolt clamped at points A and B (also C and D) for wires to pass over. At point B, both wires must lie along each other at tangent point to tube. In order to keep wires in position, diagonal wire is drawn over outer wire just above tangent point and wires are held by wooden block under screw clamp (see drawing). Underground it is done in the same way. Prior to fastening to tube, wires must be stretched by plumbs of exactly equal weight. All sightings against the wires must be *absolutely horizontal.* On surface, only points A_1 and B_1 are sighted and on bottom points C_2 and D_1. Measuring angle α half way down can be difficult in some shafts, but as a rule exact midpoint is not necessary. Extra time needed to arrange diagonal wire and to measure angle on the intermediate level is recovered since sightings to fastened wires can be performed much more quickly and safely than against wires hanging freely. As Mr. Kangas has had no opportunity to test the method in very deep shafts—especially 1 km or deeper—he is interested in hearing results of such work.

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PERFORMANCE records from twenty years of handling all types of slimes, slurries and other fine mesh abrasive suspensions show definite savings from the use of Allis-Chalmers Rubber-Lined Pumps. Instances of 10 to 50 times the life of the finest alloy pumps built for this service are common. Not only are pumping costs reduced, but production lost from shutdowns is almost eliminated and standbys often can be done away with.

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If you are handling sand, taconite, grinding mill discharge, tailings or any other abrasive slime or slurry, ask your Allis-Chalmers representative to show you how you can get long pump life and low cost per gallon pumped. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, and ask for Bulletin 52B8156. A-4768

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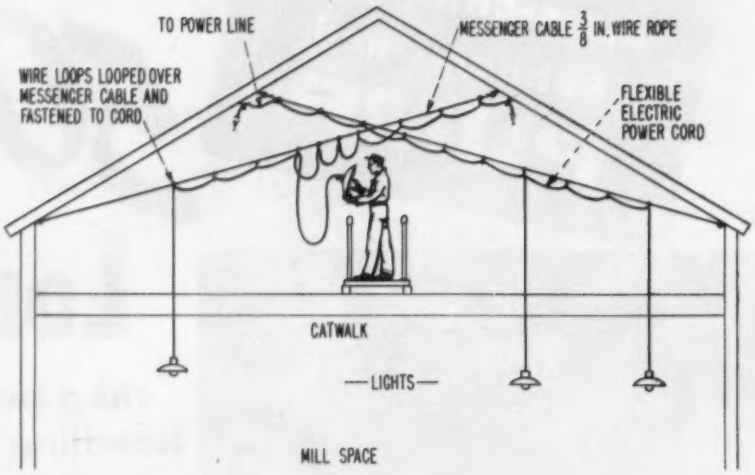
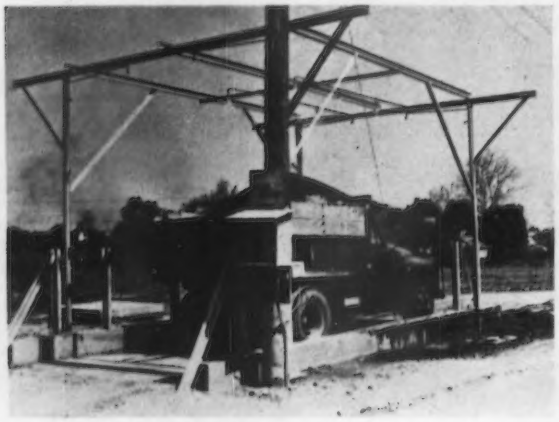
OPERATING IDEAS *(Continued)*

Lighting Scheme Simplifies Care

ACCESSIBILITY PROBLEM is solved with this lighting arrangement. Fixtures are suspended from flexible power cord to which wire loops are fastened at intervals of a few feet. Loops slide along slanted wire rope anchored to roof rafters. A pull on flexible cord moves light fixture up to catwalk where bulb can be changed with ease and safety. Angle of messenger cable allows weight of fixture to pull light back down to desired position where it is held by flexible power cord.

Dick May, mine and mill electrical supplies and service, Wallace, Idaho, says this system has met with favorable approval wherever installed.





Automatic Spray Saves Time

WETTING DOWN TRUCKLOADS of dusty crushed limestone is easily done by an electronically-operated spray at M. J. Grove Lime Co., Frederick, Md. Trucks leaving the plant are driven under a steel spraying rack supporting eight water sprinklers. An electric eye at entrance starts 2 hp Deming pump when truck breaks path of beam. Windshield wipers going, truck continues through rack and another electric beam at exit stops pump when truck clears. Truck leaves plant with load wetted down and body rinsed.

Grove Co. engineer, Col. Robert Barrick, designed overhead apparatus to comply with state laws requiring truck-carried limestone screenings to be wet down during summer months. Setup saves time and inconvenience of driver having to leave truck.

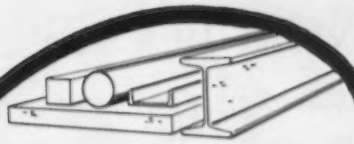
Pump is located in 8-ft pit over a well near sprayer. Operating at 30 lb pressure, it delivers 15 gpm from 20-ft-high sprays.

Small Pistol Grip Rock Drill Aids Underground Surveying

PLACING SURVEY STATIONS with a small rock drill has speeded underground surveying at the Galena mine of American Smelting and Refining Co., Wallace, Idaho. Cleco's "Handi-Drill," lightweight (9 lb), air-operated, self-rotating, pistol-grip drill, is used with a ⅜-in. tungsten-carbide bit. Holes are drilled to a depth of only 1 to 2 in. A ½-in. hardwood dowel, precut to 2-in. lengths serves for plugs to hold ordinary spads. A 50-ft length of ¼-in. air hose equipped with "snap-on" couplings to fit standard mine spuds, completes the outfit.

According to William E. Lightfoot, mine engineer, Bishop, Calif., this equipment, together with conventional illuminated backsight, permits an instrument man and helper to set stations with a minimum of delay to mining crews. Required hole can be drilled in quartzite for example, in 45 to 90 seconds. In addition, no time is lost "rustling" machines and hoses from other areas in the mine. Transporting the small drill and light hose along with regular surveying equipment is not burdensome since two men are generally used wherever much surveying must be done. Maker of drill is Cleco Div., Reed Roller Bit Co., Houston, Tex.

call Ryerson for steel



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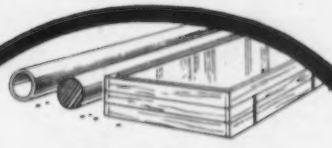

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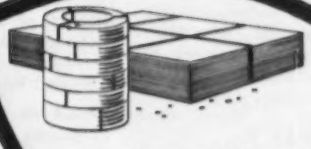

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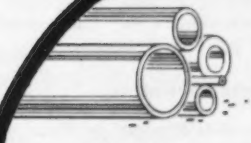

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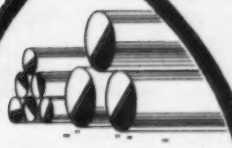

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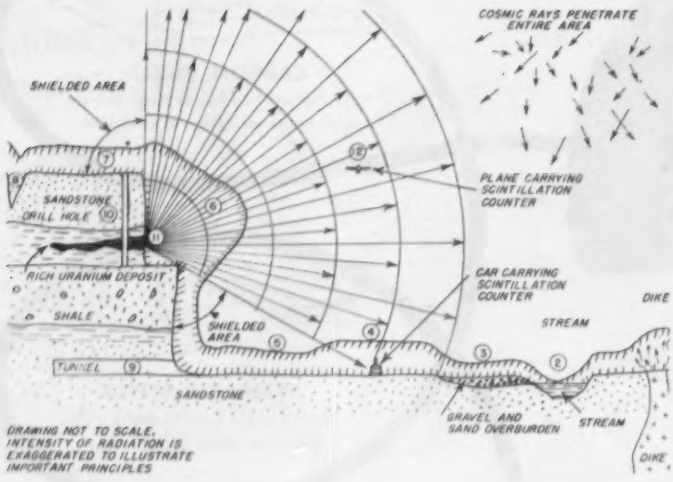

Prospecting For Atomic Minerals, by Alvin W. Knoerr and George P. Lutjen, editor and managing editor respectively of *Engineering and Mining Journal* and co-authors of well known *EM&J* article, U_3O_8 — *Formula for Profits.*

Written by men who know how to write and know what they are writing about. Covers your stake in atomic minerals; how to recognize them; where to look; what you should know about U. S. and Canadian mining laws; how to stake a claim; how to prospect; radiation, what it is and how to detect it; what to do when you find uranium, thorium, beryllium and lithium; and where, when and how to get help.

Diagram opposite shows one of the many drawings used to illustrate the text and to show you how to get the most out of your time, money and equipment. Know how to use a map? A counter? Compass? What to take along? Where to buy equipment? Where to sell your ore? This book will tell you. For amateurs and hobbyists. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 36. 213 pp. Price $3.95.

• Application for the following free literature should be made to the address below. Because of the limited editions, only one copy of any particular edition can be sent to any one person and only a modest number of a variety of publications can be furnished to an applicant. Please order only those publications actually needed. Publications Distribution Section, U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa.

Information Circular 7719, Slate, by Oliver Bowles. Deposits and distribution in the U. S. 12 pp.

Information Circular 7720, Memorial Stone, by Oliver Bowles. Granites and marbles and their distribution in the U. S. 6 pp.

Information Circular 7721, Study of the Tungsten Potential in Boulder County, Colo., by Carl Belser. Mills, plants, flowsheets, geology and deposits in text and tables. 39 pp.

Information Circular 7722, Permissible Mine Equipment Approved During the Calendar Years 1953-54, by R. A. Kearns and H. B. Brunot. 12 pp.

Information Circular 7723, Survey of the Literature on Electrodeposition of Molybdenum, by T. T. Campbell and A. Jones. 6 pp.

Report of Investigation 5124, Manganese from Steel-Plant Slags by Lime-Clinkering and Carbonate-Leaching Process, by R. A. Heindl, J. A. Ruppert, M. L. Skow and J. E. Conley. Part one of two. Flowsheets and 98 pp.

Report of Investigation 5129, Preliminary Electric Smelting Research on Philippine Nickeliferous Ores, by L. H. Banning and W. E. Anable. Covers the use of bagasse, a sugar refinery by-product, as an economically feasible carbonaceous reducing agent for smelting the Philippine laterites and serpentines to low-carbon ferronickel. Absence of cobalt in ore aids in the smelting practice. No serious metallurgical problems were encountered. Photos and 13 pp.

Report of Investigation 5133, Milling, Refining and Granulation of Cobalt Powder, by J. D. Marchant, L. H. Banning and W. F. Hergert. 14 pp.

Report of Investigation 5130, Physical Properties of Mine Rock, Part 3, by B. E. Blair. Charts, graphs, tables and text covering physical properties of mine rock from 84 mines, quarries and blasting research test sites. 69 pp.

Report of Investigation 5138, Investigation of the Kokomo Zinc Deposits, Summit County, Colo., by W. H. Hamilton and R. R. McLellan. 28 pp.

Report of Investigation 5139, Investigation of the Copper King Copper-Gold-Silver Deposits, Silver Crown Mining District, Laramie County, Wyo., by J. H. Soule. 37 pp.

• Professional Papers and Bulletins from the Geological Survey may be obtained from Superintendent of Documents, Government Printing Office, Washington, 25, D. C. Remittances should be sent by money order.

Bulletin 1015-G, Zinc-Lead-Copper Resources and General Geology of the Upper Mississippi Valley District, by A. V. Heyl, E. J. Lyons, A. F. Agnen, C. H. Behre Jr., H. B. Willman and R. R. Reynolds. Prepared in cooperation with the Wisconsin, Illinois and Iowa State Geological Surveys. One map and 16 pp. Price 70c.

Bulletin 1024-A, Radioactivity Investigations in the Cache Creek Area, Yentna District, Alaska 1945, by G. D. Robins, Helmuth Wedow Jr. and L. B. Lyons. Concluded that the area's placer deposits do not contain sufficient radioactivity, but total value of the other valuables in the placers may make it worthwhile to prospect the area. 22 pp. Price 65c.

Bulletin 1030-A, Search for Uranium in the United States, by V. E. McKelvey. Concerns work done on behalf of the AEC and published with their permission. 60 pp. Price 25c.

Bulletin 1036-A, Rapid Field and Laboratory Method for Determination of Copper in Solids and Rocks, by H. Almond. Rapid biquinoline method that permits 60-80 determinations a day under field conditions. 7 pp. Price 10c.

Reports and Bulletins

Bulletin No. 428, Strength in Shear of Reinforced Concrete Beams, by Armas Laupa, Chester P. Siess and Nathan M. Newmark. Published by Office of Publication, Administration Building, University of Illinois, Urbana. 73 pp. Price $1.

Bulletin No. 430, Stresses Around Mine Openings in Some Simple Geologic Structures, by R. D. Candle and G. B. Clark for University of Illinois. Urbana, Ill. 41 pp. Price 65c.

Bulletin No. 9, Vol LVIII, University of Minnesota Mining Directory Issue 1955, by Henry H. Wade and Mildred R. Alm. Minneapolis, Minn. 278 pp.

Boletin No. 150, Geologia do Centro-Leste Mato-Grossense, por Fernando F. M. De Almeida. Divisas de Geologia e Mineralogia, Rio De Janeiro, Brazil. Map and 92 pp.

Circular No. 15, Tables of Fluorescent and Radioactive Metals. Revised second edition by Ming-Shan Sun for New Mexico Institute of Mining and Technology, Socorro, N. M. 17 pp.

Technical Assistance Mission No. 127, The Mining and Dressing of Low-Grade Ores in Europe. Round-up of low grade ore dressing techniques in Europe. Touches lightly on the subject with flowsheets from many mills in Europe. 319 pp. Price $2.75.

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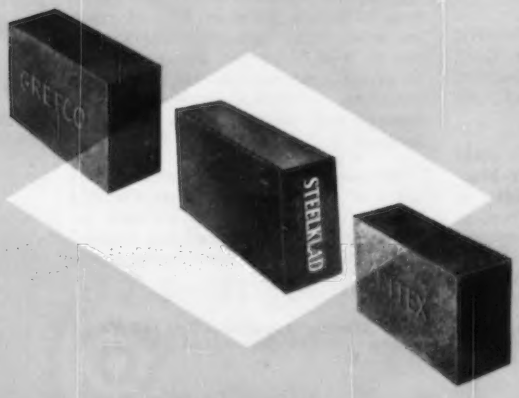

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PERSONALS

Anaconda Announces Key Personnel Changes

RUSSEL B. CAPLES (left), president of Anaconda Aluminum Co., has been named vice president in charge of metallurgical operations of the Anaconda Co., succeeding Frederick Laist who retired. Mr. Caples has been associated with the Anaconda organization since 1910. **William Wraith Jr.,** (center) assistant general manager of Chile Exploration Co., Chuquicamata, Chile, has been named assistant to Mr. Caples. He has been with Anaconda since 1926. **C. Jay Parkinson,** (right) counsel for the Anaconda Co. since 1941, has been named vice president and director of Anaconda Aluminum Co.

Robert P. Bremner, former assistant to the vice president in charge of operations, Youngstown Sheet & Tube Co., has been named manager of mining operations. He joined the company in 1948.

Julius B. Haffner, president of Silver Mountain Lead Mines, Inc., has been elected president of the International Oil & Metals Corp.

R. W. Maki and **W. F. Gasper,** project engineers, Minnesota Ore Division of Jones & Laughlin Steel Corp., have been promoted to resident engineers.

Dr. William E. Wrather, director of the U. S. Geological Survey, received the department's Distinguished Service Award from Assistant Secretary Felix E. Wormser, September 21. He was appointed director in 1943.

Edwin H. Crabtree Jr., has been appointed director of the Colorado School of Mines Research Foundation, succeeding V. L. Mattison.

W. Lunsford Long, president of the Tungsten Institute, has been elected president of Haile Mines, Inc., the Tungsten Mining Corp., and Manganese, Inc., succeeding the late Hewitt S. West. Mr. Long has been serving as vice president of all three firms.

Oscar W. Glaeser, vice president and general manager, western operations, United States Smelting Refining and Mining Co., has been named a director of American Mining Congress.

Karl W. Jasper, president of the Northwest Mining Association, Spokane, Wash., has been appointed general chairman for the association's 61st annual convention to be held in Spokane, Dec. 2-3. **Frank N. Marr** has been named assistant general chairman.

John J. Curzon, former manager of Howe Sound Co.'s operations at Holden, Wash., and now director of exploration and development for Climax Molybdenum Corp., was recently in Spokane, Wash., after inspecting the company's newly acquired uranium properties on Prince of Wales Island, Alaska.

James E. Castle, general manager of Foote Mineral Co.'s plant at Kings Mountain, N. C., has resigned to become manager of the minerals division, International Mineral and Chemical Corp., Chicago.

Jay C. Dotson, former instructor in mining engineering, Missouri School of Mines, has become assistant professor of mining engineering, College of Mines, University of Idaho, Moscow.

David J. McDougall has set up a geological consulting practice in Montreal, Canada. He was formerly engaged in mine and property evaluation for an investment counseling firm in Toronto.

Richard C. Cole, plant manager of the Salt Lake City mill of Vitro Uranium Co., has been named assistant general manager of the company. Prior to joining Vitro last year, Mr. Cole was associated with American Smelting & Refining Co. for 20 years.

A. G. Roach, mill superintendent, Malartic Gold Fields, Ltd., Halet, Que., has resigned to accept a similar position with Algom Uranium Mines, Ltd., Algoma Mills, Ont., Canada.

Paul W. Allen has resigned as plant manager of National Lead Co.'s MacIntyre Development in New York, to join the staff of Cyprus Mines Corp. in Los Angeles, Calif. He will be responsible for the Copper Queen and Old Dick Mines, near Bagdad, Ariz. He has also been elected vice president and general manager of Pima Mining Co. which owns and will develop a low grade copper deposit near Tucson, Ariz.

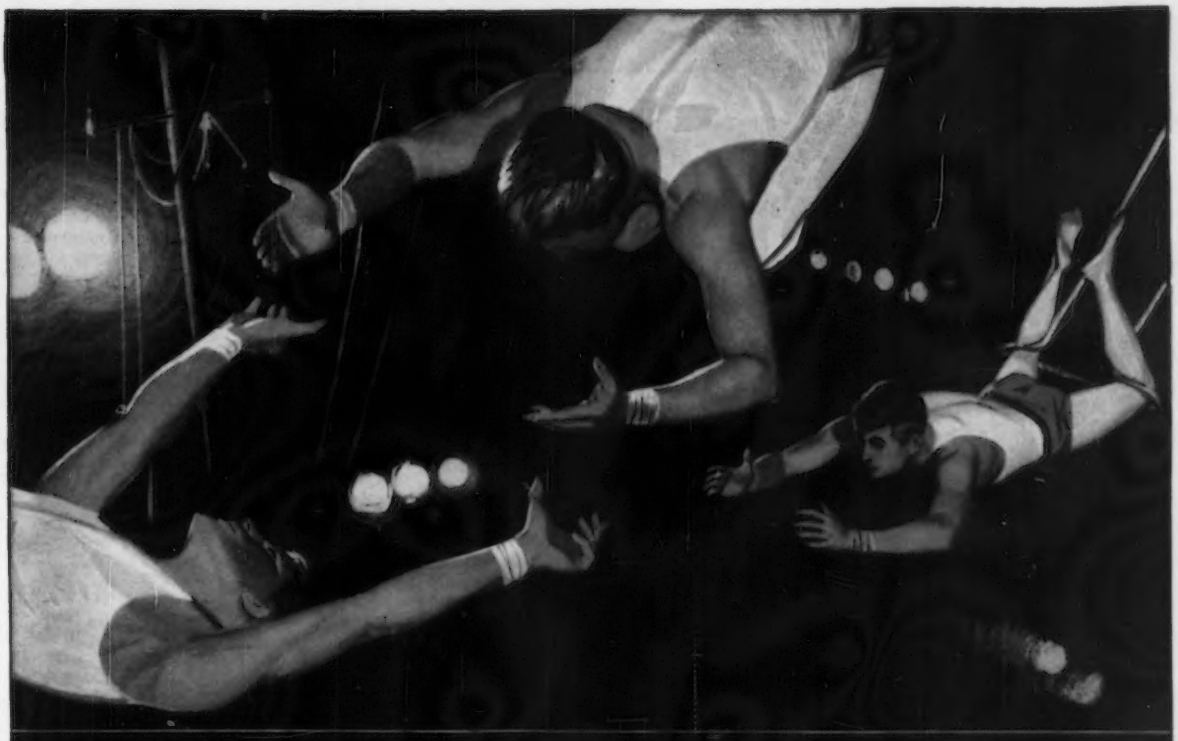
J. V. Reynolds, president, Joplin Machinery & Electric Co., has transferred most of the company's operations from Joplin, Mo., to its new office in Albuquerque, N. M., where they are conducting a large scale exploration program in preparation to opening up a uranium project in the Grants, N. M., area and in Utah, and a large copper deposit in New Mexico.

Gordon Weller, public relations director for western operations, Climax Molybdenum Co., has been named advertising manager for the company. **Don Stephens,** assistant director of western public relations, succeeds Mr. Weller.

Climax Molybdenum Co., has made the following changes at its Climax, Colo., operations. **Byron March** has been named mill operating foreman. He had been assistant shifter in the mill department. **Paul Ducharme** has been promoted from budget director to assistant controller. **Fred Hoff** has been named director of metallurgical research.

C. G. Bowers, formerly general manager of the Aramayo mines and operations in Bolivia for more than 15 years, has returned to Santiago, Chile from a trip to New York and Europe recently on professional business. He is a mining consultant associated with Tower & Bowers, with offices in New York and Santiago.

Alexander C. Brown, chairman of the board of Cleveland Cliffs Iron Co., has relinquished his duties at his own request following a board meeting September 21. Mr. Brown joined the company in 1934 as first vice president.



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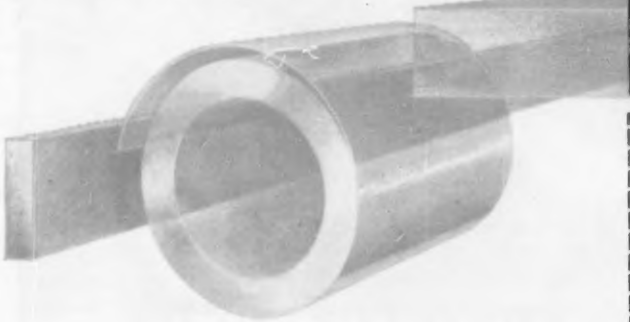

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PERSONALS *(Continued)*

R. KIRBY SHIRLEY (left), and **Pearson E. Neaman,** (right) have been elected senior vice presidents of Freeport Sulphur Co. Mr. Shirley, who also is treasurer of the company, has been with Freeport since 1922. Mr. Neaman, general counsel for the company, joined Freeport Sulphur Co. in 1930 as secretary of the firm.

Van H. Smith Jr., mine superintendent, San Xavier mine, Eagle Picher Co., has joined Algmo Uranium Mines, Ltd., Blind River, Ontario, Canada.

Allan E. Jones has been named deputy manager of the AEC's Grand Junction Operations Office, succeeding **Edwin H. Crabtree,** who resigned to become director of the Colorado School of Mines Research Foundation. For the past three years, Mr. Jones has been on assignment in Johannesburg, South Africa for the AEC raw materials program.

Thomas L. Kesler, chief geologist, Foote Mineral Co., has returned from a third of a series of trips covering development in the lithium-ore districts in Canada by the company.

Gordon J. McCulloch has joined Bunker Hill & Sullivan Mining & Concentrating Co. as electrical superintendent.

Lawrence A. Roe has been named minerals beneficiation engineer, engineering division of International Minerals & Chemical Corp. He was formerly with the Bjorksten Research Laboratories.

Gordon Dean, associated with Lehman Brothers, **Joseph H. Hirshhorn,** metal mining executive, and **Philip D. Wilson,** consulting mining engineer and geologist, have been elected directors of Callahan Zinc-Lead Co.

Richard L. Schumacher, former geologist for New Jersey Zinc Co., has joined Manu-Mine Research and Development Co., Reading, Pa.

E. H. A. Andrews, formerly executive vice president, has been named president of Verdi Development Co., Los Angeles, succeeding **Clifford Gillespie** who was named chairman of the board.

John H. Stitzer has resigned from the R. Maturi Corp., Chisholm, Minn. to join the Potash Co. of America, Carlsbad, N. M., as staff engineer.

Blaine L. Wiseman is now located in Chanaral, Chile as junior geologist for the Andes Copper Mining Co., a subsidiary of the Anaconda Co.

J. E. Foard has been appointed metallurgist at the Douglas Smelter, Phelps Dodge Corp. He joined the company 7 years ago.

Charles A. Lindberg has been named superintendent of maintenance, Oliver Iron Mining Division's eastern district. **Quinton T. Martin** was named to the newly created post of manager-industrial engineering for the division.

Walter L. Rice, president of Reynolds Mining Corp. and vice president of Reynolds Metals Co., has been named by Secretary of the Interior Douglas McKay to serve on the Industry Advisory Committee on Aluminum.

OBITUARIES

Emmett Butler, 85, president of Pioneer Mining Co., Iron Range Natural Gas Co. and others, died August 24 in St. Paul, Minn. He was a prominent figure in Lake Superior mining circles for over 50 years.

Lafayette Hanchett, 87, retired chairman of the board of Utah Power & Light Co., died recently at Salt Lake City, Utah. He had been manager of the Boston Cons. Mining Co. prior to joining Utah Power & Light.

John C. Rix, 79, president of La Luz Mines, Ltd., died September 7. He was treasurer and director of Opemiska Copper Mines (Quebec) Ltd., and a director of Sherritt Gordon Mines, Ltd., Michipicoten Iron Mines, Ltd. and Ventures, Ltd.

Dale L. Pitt, 71, retired mining engineer of Seattle, Wash., died September 10. A graduate of the University of Utah School of Mines, he joined American Smelting & Refining Co. in 1915, was general manager of Premier Mining Co. for 16 years and operated the Big Bell Gold Mine in Western Australia. He was president of the Canadian Mining Institute for several years.

John Hulst, 83, former vice president of United States Steel Corp., died Sept. 15 in Grand Rapids, Mich. He retired from U. S. Steel in July 1942 after 40 years of service with the corporation and its subsidiaries.

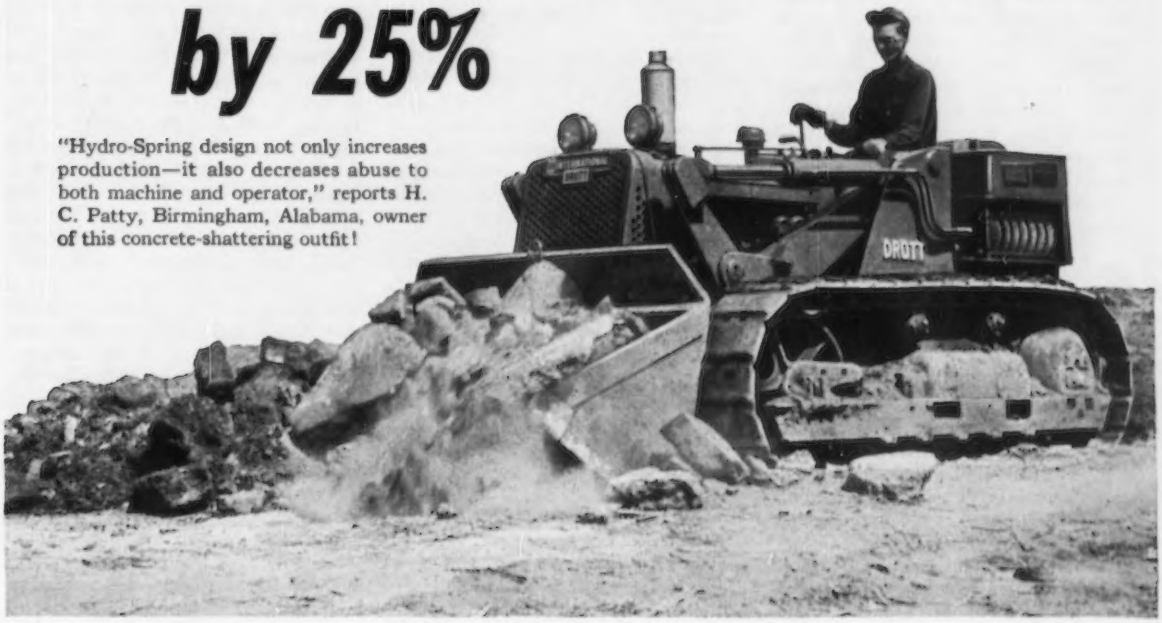
Dr. Charles Allen, 43, operations manager of the Waterbury, Conn. pilot plant, American Cyanamid Co., died August 25 while on vacation in Colorado. A graduate of the Colorado School of Mines, Dr. Allen joined American Cyanamid in 1942.

OUTSTANDING SCALE-MODEL WORK of Kennecott Copper employee **Basil Doman,** was again the feature attraction of Utah Copper Division's display at the Utah State Fair, Sept. 16-25. Mr. Doman, a locomotive engineer, has spent 12 years making these models which actually perform like the actual equipment itself. The models are made of sheet brass and copper. Only the electric motors, gears, wheels and couplers are made commercially. Tools used are files, drills, saws and solder.

How Hydro-Spring's "Shock Cushion" Helps Skid-Shovels outlast all others

by 25%

"Hydro-Spring design not only increases production—it also decreases abuse to both machine and operator," reports H. C. Patty, Birmingham, Alabama, owner of this concrete-shattering outfit!



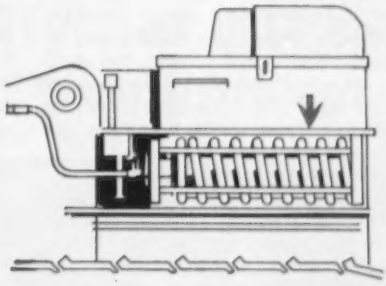
Slam this super-stout bucket into compacted material, and you generate impact stresses that make unprotected front-end loaders shudder!

But International Drott Skid-Shovels smother these shocks enroute, before they can sprain a sacroiliac, strain a track frame, or maim a final drive! Machine-mauling shock stresses "lean" against exclusive Hydro-Spring's "magic cushion"—and they're absorbed!

No Strain! No Pain!

You apply the patented pry-action break-out—and you get up to three times as much material-loosening, bucket-cramming force as the ordinary front-end loader can muster. Even then, shock-swallowing Hydro-Spring wards off strain and pain! *Owners declare that Hydro-Spring adds a whopping 25 per cent to loader and tractor life—reduces downtime and boosts production, too!*

No other front-end loader has Hydro-Spring advantages—which you get in four big-capacity, contractor-proved International Drott Skid-Shovel sizes. Why not ask your International Drott distributor for a demonstration of the money-making size best suited to your needs?



How exclusive Hydro-Spring works and saves for you!

Exclusive Hydro-Spring is a hydraulic cylinder enclosed in a heavy-duty coil spring. Shock force displaces oil from main lift cylinders into the Hydro-Spring cylinder—extending it and compressing the big spring to *absorb* and *cushion* impact loads. Hydro-Spring reduces the consequences of shock forces *by an actual 67 per cent or more*—also eliminates most hydraulic hose failures!

INTERNATIONAL HARVESTER

INTERNATIONAL® DROTT

(*Continued from p 93*)

ent upgrading from one cleaner step to the next, and pulp levels and dilutions at these points have little influence on the final product.

A maintenance problem in the flotation section is selection of material for conditioner and flotation machine parts. Abrasion makes steel rather expensive. Natural rubber cannot be used because of the oil in the pulp. This is the problem with Neoprene now in use. It gradually swells and then disintegrates. Other synthetics have been tried, but resistance to abrasion goes down as the ability to resist oil increases. Experiments are being conducted with other types of conditioner units.

Reagents

The reagent setup is interesting because of the variety of reagents and quantities used per ton of ore treated. They consist of sulphur dioxide added to the cyclone overflow after the sampler, and an emulsion made up of soap skimmings, diesel oil and Oronite-S added just ahead of the conditioners.

SO_2 acts as an activator and the emulsion is the collector and frother. Soap skimmings are a byproduct of the sulphate paper industry, and Oronite-S (sodium alkyl aryl sulphonate) is an emulsifying agent for the oil in water. It also acts as a promoter for manganese and gangue minerals. Recovery of both can be improved by an increase in the reagent, but there is no selectivity. Other sulphonates tried have given similar results. No effective depressant has been found for silica or sulphates.

Control of the pH matters little. Natural pH of water is 8.3 (from Lake Mead), and pulp in flotation is about 8.0. Depressants tried include sodium silicate, quebracho, caustic soda and trisodium polyphosphate. When used in sufficient quantity they do act as depressants for all minerals, including manganese minerals. None are used at present. Consumption of reagents is shown in the accompanying flowsheet.

Filtration

Final concentrates are filtered in four 8½-ft, 10-disk filters after prior treatment in two 12-in. cyclones installed above each filter unit. Provision is made to bypass the cyclones and feed concentrates direct to the filters if this is desired. Installation of the cyclones has improved filter operation materially. It had been found that the high oil content of the concentrates tends to agglomerate them, forming large flocs and balls when agitated by the thickener rake mechanism. The cyclones thicken and disperse the granular concentrates and give an even feed to the filters. Overflow from the cyclones goes to a 120-ft traction thickener. The underflow is fed to the filter tanks below the leaves. Final flotation tailings are treated in a 165-ft traction thickener, the underflow being pumped to a storage pond and the overflow to the kiln plant for reuse.

Cotton filter bags do not give satisfactory service. After testing many types of synthetic fibers, good performance was achieved with a staple fiber nylon furnished by National Filter Media Corp. and designated as NS-1209. In addition to great strength, protruding fiber ends give the material a fuzzy surface. This holds the heavy cake on the disks until it reaches the discharge point. Aerofloc 548 used as a flocculating agent is effective.

Kiln Plant

Filtered concentrates transported from the mill to the kiln plant assay more than 40% manganese. Nodulizing increases this figure from 5 to 7%. Principal plant units include two 8x150-ft calcining kilns; 10x150-ft nodulizing kiln; 8x96-ft rotary cooler; calcine kiln dust scrubbers; and nodulizing kiln primary and secondary scrubbers and lead recovery. Operations are supervised by Wm. Kendrick, superintendent.

Kilns are lined with fire clay brick (60% silica and 40% alumina), and fuel is Bunker C oil. The burners are Pan American and Coen units. Oil consumption per ton of feed for the calcining kilns amounts to about 2 gal, and that for the nodulizing kiln, 10 gal.

Principal purposes of the calcining kilns are to drive off reagents and combustible products contained in the feed and to preheat the charge for the nodulizing kiln. Raw feed contains from 23 to 25% reagents and up to 28% moisture. To this are added petroleum coke crushed to minus ⅜ in. and soda ash in amounts of 2½% of dry concentrate weight and ¾ of 1% respectively.

Coke is added to reduce the lead in the charge (about 3%) so that it may be fumed off, and soda ash reduces dust losses by pelletizing concentrates in the calciners. Temperatures at the feed and discharge ends of the kilns vary from 800 to 1,000 deg F and 1,000 to 1,400 deg F respectively. Gases are treated in two wet cyclone scrubbers, with recovered dust pumped back to the thickener at the mill.

Nodulizing kiln is fired by two Coen burners, one in the center and the other in the wing. Temperature is raised to from 1,850 to 2,200 deg F as the hot calcines pass down the kiln, depending on the silica content of the charge. Lead, fumed off either as an oxide or a sulphate, and kiln gases, are treated successively in a multiclone and a two-stage wet cyclonic scrubber. The resultant sludge averaging 35% lead and from 18 to 20% manganese is pumped to 160x8-ft tanks for settling, grading and storage. It is shipped as a lead concentrate.

Calcine build-up and rings in the kiln are scraped off by a water-cooled boring bar 20 in. in diameter and 40 ft long at 4-hr intervals. Rings form beyond the end of the boring bar and are probably due to improper silica lime ratios, excess coke, improper flame control and a host of other causes. Addition of coke to the calcines only increases the difficulty. Good lead elimination takes place when the silica content of the charge is below 9%. It has also been found that if the ratio between silica and alkaline earths is 1:1, the lead elimination is easier even when silica content is more than 9%. Nodule size is held below 5 in.

Use of variable speed drives on the kilns affords considerable flexibility as to retention time and load. For instance, motor output on the calcining kilns ranges from 18 to 50 hp, giving speed selections from ¼ to 1¾ rpm, while the figures for the nodulizing kiln are 25 to 75 hp and ¼ to 2 rpm. Latter unit normally operates at 1½ rpm. Other control equipment includes Honeywell temperature recorders and optical pyrometers to measure kiln temperatures, and a Brown temperature recorder to measure temperatures in the multiclone.

Nodulized material discharged from the kiln is cooled to about 300 deg F after passage through a rotary cooler lined 2/3 of its length with firebrick and equipped with lifters. From the cooler discharge end, the nodules are carried by a pan and belt conveyor system through a sampling plant to the storage area. Here they are blended to specification (45% manganese and less than 1% copper, lead and zinc) and stockpiled before shipment.

Power Supply

Electric power is supplied from the lines of Basic Management, Inc., at 69 kv to the main substation where the voltage is stepped down to 2,300 for distribution to three substations serving the crushing plant, flotation mill and kiln plant. The primary crusher and rod mill motors use 2,300 v, while all other plant machinery operates on 440-v current. Water is obtained from the 42-in. line of Basic Management, Inc., which crosses the property.

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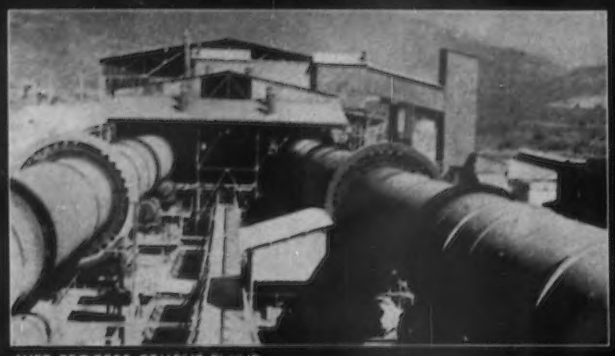

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Stockpile Inventory Hits $5.6-Billion as Buying Continues

LEAD AND ZINC still accounts for the largest volume of mineral purchases for the Government's stockpiles, according to latest semi-annual report just published by Office of Defense Mobilization.

Report takes the line that the Government will be able to complete its minimum stockpile requirement "in the near future." But it remains to be seen whether and how soon the Government will end its program for such materials as lead and zinc, which are being bought to keep domestic producers in operation.

There's no doubt, though, that the trend is toward a tougher policy on stockpile purchases. Not only are present minimum goals being attained; but war planning is being based on a shorter mobilization period and a shorter war. Hence, stockpile goals, originally based on five-year supply for an all-out war, may be more than enough because a shorter war means less for reserves of such materails.

For instance, between January and June ODM initiated approximately 42 reviews of stockpile materials. Of these, 17 were completed, resulting in the following actions: Increased obectives for nine materials; decreased objectives for five; reaffirmed objective for one; addition of one material to the list and removal of another.

Also up for review during the first six months of the year were storage and maintenance facilities used by the stockpile program. As of June 30, 1955, there were 273 locations where strategic and critical materials were stored, this is 21 less than at the beginning of the period when commercial storage was eliminated where possible and replaced by Government-owned facilities. ODM also made progress in providing safe storage for combustible materials, and protecting outdoor ore storage piles.

During first six months of 1955, over a million tons of materials worth $300-million were delivered to stockpiling centers. This increase brings the current inventory up to $5.6-billion.

Of the $7-billion current objective, ODM has already purchased $4.7-billion worth of materials; $256-million of it during the first six months of this year.

On the legislative scene, the Senate Mining Subcommittee has published a report criticizing the Department of Interior's failure to step up its manganese research and development program.

Subcommittee called purchases of manganese ore, since World War II, "fully justified" and stated that these purchases should be continued and domestic mines kept open. Up to July 1, 1955, some 11-million units of recoverable manganese were collected at three depots: Butte-Phillipsburg, 1,728,001 recoverable units; Wenden, 6,108,000 units; and Deming, 3,256,174 units.

The purchases will continue until the end of June 1958, or until quotas established by ODM are satisfied, whichever comes sooner. One purchase depot has reached its quota and closed.

Most of the ores are of low grade and are of no immediate use unless beneficiated. The Subcommittee feels that research work being done on refinement processes is not being pushed hard enough. It calls Interior's interest in the domestic minerals industry "mercurial-like" and described it as burning at fever pitch at times and then subsiding into a coma.

Interior officials say our present program is progressing at an adequate rate and will insure the needed supply of manganese in case of national emergency. They point to pilot plant studies being carried out by the Bureau of Mines and the research work being done by private industry with the assistance of GSA.

A major point at issue here, as in many development and stockpile program disputes, is the question of just how long a national emergency will last. Many argue that in an atomic war the possession of vast quantities of raw materials will be worthless. On the other hand the advocates of greater reserves feel that there is a strong possibility of atomic weapons being outlawed, like gas warfare. In any case they feel that it is best to be on the safe side.

In support of its position on the continued purchase of manganese ore, the Subcommittee outlined these reasons. (1) The material can be beneficiated. (2) National defense makes it imperative that we have adequate stored reserves of usable manganese for our steel industry. (3) Much larger quantities of manganese ore than are now stored in depots will be needed in a national emergency. (4) We must have an operating manganese industry, from mine to finished product, in the interests of national defense.

Committee members feel that far too much time has been wasted in getting adequate pilot plant studies operating on beneficiating processes to upgrade the low grade ore now in storage.

It was pointed out that in case of national emergency our present sources of manganese ore could easily be cut off. 33.8% of our annual imports come from Africa and 42.8% passes through the port of Goa in India. Both areas are in a state of increasing political unrest.

Mining Census Begins With Data Released on Six out of the 36 Minerals to be Surveyed

THE FIRST CENSUS of mineral industries in 15 years is now being published by the Census Bureau and the Department of Commerce. In all, up-to-date figures showing growth of all phases of the mining industries will be revealed when reports on all 36 of the basic minerals are released.

Reports will compare 1954 statistics with the last census year (1939). Information published includes the value and tonnage of shipments, capital expenditures, type and cost of machinery, and other expenditures. There is a full account of labor costs, number of employees, salaries and man-hours worked.

The papers that will come out at unspecified times during the year are on copper ore; iron ore; lead and zinc ore; silver ore; two reports on gold-placer and lode; one report on related minerals such as molybdenum, chromium and nickel; a report on titanium, mercury and miscellaneous minerals; four reports on coal; two on anthracite, and two on bituminous and lignite; one report on sand and gravel; and three reports on petroleum products, crude petroleum and natural gas; natural gas and cycle condensate, and oil and gas field contract services.

Census of potash, soda and borate minerals, one of the first issued, is a good example of the kind of detailed information available in the documents.

Here are the kind of figures that will now be available:

Item	1939	1954
Value of shipments	$17,031,000	$107,752,000
Number of Employees	2,438	6,168
Salaries	4,756,000	32,490,000
Purchased Machinery	not available	8,390,000
Capital Expenditures	not available	8,920,000
Man Hours Worked	4,388,000	9,359,000

The reports also break down the statistics according to areas. Of $107,752,000 worth of materials shipped in 1954, New Mexico accounted for $64,746,000; Texas, Wyoming and Utah for $8,351,000; and California for $34,655,000.

Until 1939, census of mineral industries was done every 10 years dating back prior to the Civil War. In 1949, when next report was due, law was amended to have minerals survey prepared along with the five-year census of manufacturers. However, funds were unavailable in 1953 and the plan was delayed. Forthcoming mineral census will therefore be for calender year 1954.

Eventually, census will be compiled in

two volumes—one by states and countries, the other by industries of 1956. Individual industry surveys will be published, as preliminary reports, as soon as they are ready during 1955. So far, reports on peat; bauxite; native asphalt, bituminous and related products; and potash, soda and borate minerals have come out. Next report due will be on sulphur. The reason that these reports were issued first was the relative ease of compiling statistics on these minerals.

Potash Suit Dismissed

A FEDERAL maritime board decision has granted a motion to dismiss the complaint by American Potash and Chemical Corp. against Pacific Coast—European Conference and member Lines: American Potash had charged Conference Lines with cancelling a legitimate contract for lower shipping rates because American Potash had not forbade one of its buyers from trans-shipping on a non-conference line after f.o.b. delivery had been made.

A May 10, 1955, letter from Conference Lines to American Potash had reinstated the contract, although the case, Docket 773, was still heard by Examiner A. L. Jordan.

Simultaneously, Jordan found Conference Lines innocent of attempting to coerce buyers and sellers of U. S. products from completing negotiations unless shipments were made via Conference ships. Mitsui Steamship Co., Ltd., had charged Conference Lines, in Docket 764, that its business had been hurt by such coercion. Jordan said evidence of coercion was inconclusive.

Copper User Sues ODM-GSA

A SMALL MANUFACTURER of automotive testing equipment is challenging the Government's copper stockpiling program. Heyer Products Co., Inc., of Belleville, N. J., has filed a suit in Federal District Court charging the Government with the responsibility for a 13 cent increase in the price of copper. This increase, the company claims, will prevent it from making a fair profit from a price-fixed Air Force contract. The contract was negotiated last January.

Heyer is asking that the court: (1) declare the ODM's copper buying program, from January to date, illegal; (2) enjoin the diversion to industry of 11,000 tons of copper that was originally scheduled for delivery to the Government through December; (3) order the ODM to release enough copper to the company for it to complete its contract.

Sinclair Weeks, Commerce Secretary, Edward F. Mansure, General Services Administrator, and Arthur S. Flemming, Defense Mobilization Director, were named as defendants in the action.

LABOR THIS MONTH

MINE UNION TAKES FLIP-FLOP: In a startling about-face, International Union of Mine Mill and Smelter Workers has come up with new defense against charges of Communist-domination. For first time in its 63-year history, Mine-Mill officials have spoken out against Communist ideology in apparent preparation for union's trial on Red infiltration charges. In the past, any such charges have always been met with claims by Mine-Mill leaders that their Constitutional rights were being invaded. Never have they publicly rebuffed Communism.

Mine-Mill's policy-making executive board now takes this stand in a public statement: "We do not believe nor do we advocate that Communism is the solution to the problems of the American working people."

This is a direct reversal of 1949 statement by former Mine-Mill secretary-treasurer, Maurice Travis at the time he signed Taft-Hartley's non-Communist oath. Travis said then: "This has not been an easy step for me to take. Membership in the Communist party has always meant to me, as a member and officer of the International Union, that I could be a better trade unionist."

WHAT'S BEHIND THE SWITCH?: First answer is that it's a defensive maneuver to fight charges by U.S. Attorney General that Mine-Mill is controlled by Communists and should be disbanded as a labor union. Attorney General Brownell has made this claim before the Subversive Activities Control Board—and the trial is in preparatory stages. MMSW leaders are worried about outcome and will argue that they are not in control of a foreign power. Rejection of Communism is the first step in that direction.

However, right-wing union leaders and others close to MMSW believe the new position may be a new line in leftist union strategy. There's little disposition to take the statement on face value. While Travis is no longer an executive board member, his former associates are still in control of the union and these are the leaders who, according to Government, follow Communist line. Other left-wing unions are being watched to see if they adopt the strategy.

There's another angle. Mine-Mill's leadership would like to convince AFL and CIO that there are no Red ties in the union. They want to be accepted in the combined AFL-CIO when official merger takes place. So far, they've made informal overtures to CIO Steelworkers and AFL's Machinists and Building Laborers Unions about an alliance—and were turned down each time. There's no chance of Mine-Mill teaming up with the new federation as long as present leadership is in control; a control firmly held by MMSW's executive board.

Thus, it's apparent that Mine-Mill will go its own way, facing a crackdown from Federal Government and membership raids by AFL-CIO. While MMSW is still strongly intrenched in non-ferrous mining industry, big troubles lie ahead.

AUTOMATION—FRIEND OR FOE: Development of new industrial equipment in mining and other industries has raised fears that machines will take the place of workers. There's concern that nation's production will eventually be handled by robots, with employees relegated to the breadline. These fears developed to a point where a Congressional investigating committee looked over subject with the help of scores of business and labor experts—and came to this conclusion: automation is a boon to economy and the people. In essence, say the experts, automation is just a further extension of the industrial revolution.

And the major concern—for displaced workers—was discounted. Probers were told that even more employees will be needed in advanced automation as keepers of the new machines. Production men will become maintenance men. Even now employees are not losing out. While an employer's payroll may not grow as fast as his output, it doesn't mean men are getting laid off. Newcomers simply are not being taken into that industry.

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Eureka Corp.'s Nevada Mine Is In Ore Along 850-Ft Drift

EUREKA CORP., Eureka, Nev., broke into a 12-ft face of ore in its drift from the TL shaft to "hole 106" on October 18. Shortly after the breakthrough, a truck-load of ore was on its way to the Midvale smelter.

Break occurred in the last 50 ft of the drift towards hole 106. Shaft was bottomed in August at 1,127 ft. Drift, on the 850 level was driven north to explore promising mineralization disclosed by the hole, which was put down during a rotary drilling campaign in 1953. (See *E&MJ*, December 1954.)

Distance from shaft station to hole 106 is about 250 ft, equal to that between the shaft station and hole No. 103 south, with the 15 ft of high grade plumbojarosite $PbFe_6(SO_4)_4(OH)_{12}$ ore intersected by the hole lying some 35 ft below the 850 level.

The TL shaft, containing 4 compartments, serves the Adams Hill area now under exploration and development. In November 1954 a small stream of water issuing from the fault at the 850 station caused crushed dolomite in the fault to wash into the shaft, slowing up sinking operations. While this condition was under control late in November, care had to be exercised during December and early January 1955, to prevent possible recurrence of the wash. The shaft was advanced for some time by mailing.

Shaft stations have been established on the 600 and 850 levels. Former contains a permanent pump station and latter an ore loading pocket. Additional stations are scheduled to be established at the 950 and 1050 levels. A steel water door has been placed in the drift adjacent to the 850 shaft station as additional protection against an abnormal flow of water. The mine now makes about 950 gpm water, principally from the mineralized fractures between the 842- and 906-ft horizons. Pump capacity available early this year was about 2½ times the flow but measures are being taken to more than double this safety factor. Three new B-J submersible pumps are being installed. Two units, each with a capacity of 1200 gpm and pumping from the shaft sump straight to the surface against a head of 1,000 ft, will be hung in the shaft compartment below the 600 level, and the standby unit capable of handling 2,250 gpm against a head of 550 ft will be installed at the 850 level. Latter will lift the water from the shaft sump to the pump station on the 600 level. The water table or ground water level is at 635 ft.

No additional drilling has been done in the Fad shaft area nor have any pump tests been made recently. Reactivation of this project depends on development of an inexpensive source of electric power. The problem is under study.

Operations are directed by Geo. W. Mitchell, vice president and general manager.

T. E. Campbell Receives Chilean Order of Merit

ORDER OF MERIT in the rank of Knight Commander of the Order of Bernardo O'Higgins was conferred upon Thomas E. Campbell (right) executive vice president, Chile Exploration Co., by Consul General Enrique Bustos (left). Looking on is Jose Maza of Chile, president of the United Nations General Assembly. Award honors "illustrious foreigners" who have lent a service of value.

In his acceptance speech, Mr. Campbell noted Anaconda's plans for expansion in Chile and said opening of La Africana mine "is today the scene of great construction activity and soon will add its production to the Chilean output." "Soon" was later defined as late 1956, according to current plans. The executive vice president also noted that, "through refining installations at Potrerillos, 75-million lb of copper now produced in the form of blister copper will be refined and cast into commercial electrolytic shapes" in Chile.

Gunnar Mines' Uranium Output Begins Moving

GUNNAR MINES LTD. started shipping uranium precipitate from its huge Beaverlodge property in late October. Shipping date is only a little more than three years from the time prospectors Albert Zeemel and Walter Blair made the discovery on the shores of Lake Athabasca, Saskatchewan.

Gunnar is under contract to supply Eldorado Mining and Refining Ltd., the Government-owned uranium purchasing company, more than $76-million worth of precipitates over a period of 5 years.

Firm had stockpiled some 90,000 tons of broken ore and the open pit, which will supply all early development ore, has been prepared to meet mill requirements.

Mill will reportedly be crushing and leaching 1,300 tpd ore and has a capacity to handle 1,750.

Gunnar officials are reputed to expect output in 1956 to run well ahead of earlier estimates and hope to sign a new expanded contract with the Government before March 31, 1956, deadline for special price deals.

President Gilbert Labine calls his company's three-year project "a Canadian record accomplished by good teamwork." Chief metallurgist Alvin H. Ross set up Gunnar's extraction process and mine manager John N. Botsford was responsible for construction at the site, which cost some $19-million.

Reserve Taconite Starts First Processing Plant

RESERVE MINING CO., Republic Steel-Armco Steel owned taconite processing plant at Silver Bay, Minn., began operations in mid-October. W. M. Kelley, who heads operations at the plant's E. W. Davis works, said the $190-million plant would produce the first pellets from "any large commercial taconite processing facility." Some small pilot plants have been operating in Minnesota for several years.

The first of 12 sections in the E. W. Davis works has been completed, with the remainder due in three or four months, said Kelley. Plant will have an over-all annual capacity of 3,375,000 gross tons of pellets and will contain the world's largest coarse crusher.

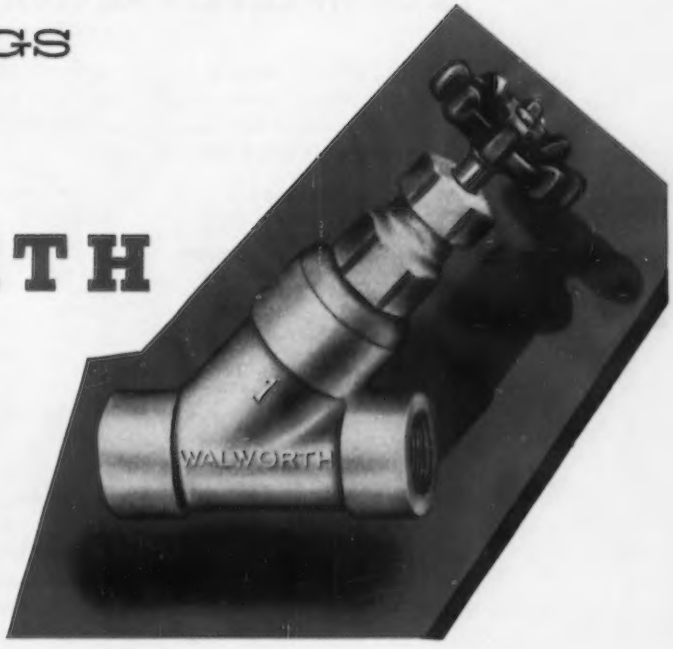
Reserve is the first of the major taconite projects being constructed by major steel and iron companies to begin operation. Youngstown Sheet & Tube Co. is

PLASTIC

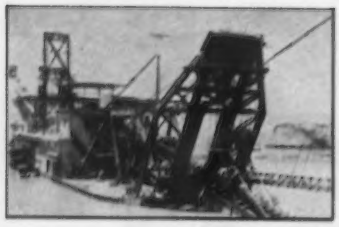
VALVES and PIPE FITTINGS

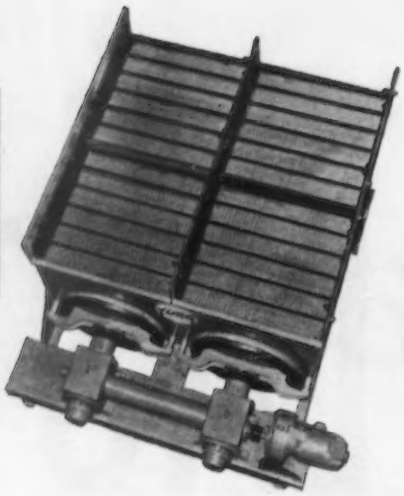
by

WALWORTH



These new corrosion-resistant valves and pipe fittings are molded of rigid polyvinyl chloride. They round out complete lines of Walworth Valves and Fittings of Steel, Stainless Steel, Bronze, Iron, and Special Alloys. A brochure explaining the complete Walworth PVC product story has been prepared for your information. Just send us your name and address. *Walworth Company, General Offices, 60 East 42nd Street, New York 17, New York.*





M-8 jig developed by YUBA for concentrating ores on dredges and in mills. It's designed to save space, reduce downtime, increase production.

FULL AREA OF

YUBA JIG BED

IS COMPLETELY ACTIVATED

YUBA jig action is positive. You set the speed and stroke wanted, get constant, even pulsations that create surface action over full area of bed. Result: YUBA M-8 jigs have a large material capacity per flow line under full control.

Any material that can be concentrated can be handled successfully in YUBA jigs, including . . .

CASSITERITE	RUTILE
GOLD	SCHEELITE
PLATINUM, ETC.	GARNETS
MONAZITE	SAPPHIRES
ZIRCONIUM	IRON
ILMENITE	COPPER

Design Eliminates Trouble Spots

Stainless steel hutch valves and screens prevent rusting and clogging. Rubber seal between screen grids and basket confines action to screen area. Long-wearing hutch diaphragms of reinforced synthetic rubber can be replaced easily.

"Package Drive" units for YUBA jigs are interchangeable, completely enclosed, self-lubricating. Generous use of antifriction bearings reduces power required. Maximum frequency of a 4-cell M-8 jig is 350 at ¼". Stroke adjustments between ¼" minimum and 3" maximum are easily and quickly made, enabling you to closely control jig action.

YUBA jigs can be installed in new or old dredges or mills to supplement existing jigs or to replace other concentration methods. Send us data on ore, feed sizes and present installation if you wish us to furnish details to adapt YUBA jigs to your operation.

71R

YUBA DREDGES · PROVED DEPENDABILITY AROUND THE WORLD

YUBA MANUFACTURING CO.

Room 600, 351 California St., San Francisco 4, California, U. S. A.

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Reserve Mining *(Continued)*

teamed with Bethlehem Steel and others to produce taconite from the $300-million Erie Mining Co. (See *E&MJ*, March 1955, p 71.) U. S. Steel Corp.'s Oliver Iron Mining division is also constructing a huge project on the Mesabi range. Cleveland-Cliffs Iron Co. is also planning to produce pellets from jasper on the Marquette range in Michigan.

IM&CC Builds Mica Plant

INTERNATIONAL Minerals & Chemical Corp. has begun construction on a ground mica plant at Greeneville, Tenn. The plant will reclaim mica from silt that has accumulated behind the Davy Crocket Dam near Greeneville. The product will find a market in roofing, paint and rubber. The cost will be $400,000; initial capacity will be 100 tpd.

Northern Ontario Seeks First Mining Museum

CHAMBERS OF COMMERCE of Haileybury and Cobalt, Ont., are soliciting funds for construction of the first museum in the area, to be dedicated to the mining industry "that developed the north and made Canada strong."

Scheduled cost of the museum, which will contain specimens, old equipment and paintings and pictures, has been set at more than $25,000. The committee has requested that donations be made out to the Cobalt Mining Museum Committee and mailed to L. R. Pirie, treasurer, at the Canadian Bank of Commerce, Cobalt.

New Aluminum Plant for Quebec

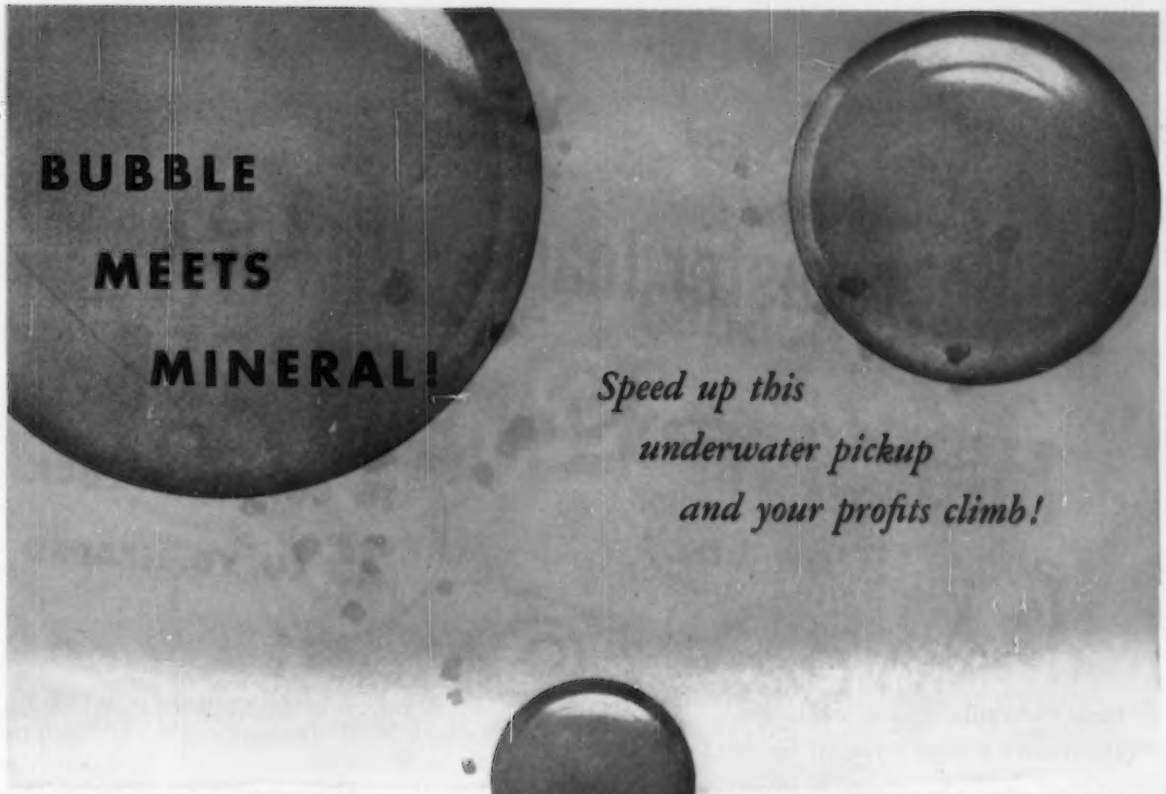
BRITISH ALUMINIUM CO. LTD. will build a $130-million aluminum smelting plant at Baie Comeau, 250 miles northeast of Quebec City. Four stages, each representing an annual output of 80-million lb of aluminum ingots, are to come into production in 1957, 1959, 1960 and 1965. Construction will reportedly begin in the spring of 1956.

Reynolds Buys Plant

REYNOLDS INTERNATIONAL, subsidiary of Reynolds Metals Co., has gained control of an aluminum sheet and foil plant at Cap-de-la-Madeleine, Que. In pointing out that the acquisition marks Reynolds first entry into Canada, J. Louis Reynolds, president, said expansion of the plant is contemplated.

Kennecott Acquires Control Of Nigerian Columbite

CHARLES R. COX, president of Kennecott Copper Corp., and Anthony M. Coskinas, managing director of Tin and Associated Minerals, Ltd., of Nigeria, announced completion in late September of negotiations by which Kennecott has obtained a 52% interest in the Nigerian company, the owner of a columbium



Armour flotation reagents compel the fastest attachments known —selectively float higher concentrations in less time for as little as 7¢ per ton!

The coating reaction between an Armour flotation reagent and the *specific* mineral you want is instantaneous. The Armour-treated minerals then attach quickly and firmly to rising air bubbles. As a result, you achieve a higher percentage of mineral recovery—along with increased throughput. You use less equipment, too, because the sharp selectivity of Armour cationic flotation reagents enables you to recover minerals without using an extra cleaner flotation step. And you can float the minerals from one ton of ore for as little as 7¢!

Armour produces a wide range of both cationic and anionic flotation reagents. For information and samples, send the coupon at right. Or write us, if you have a specific separation problem. Whether you want to float your minerals to concentrate them or reject them, we can suggest an Armour flotation reagent which will float more of the exact minerals you want *one by one*—in less time and at less cost.

PROVEN SEPARATIONS

Amblygonite • Barite • Beryl • Cement Rock
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Kaolinite • Manganese • Mica • Phosphate • Potash
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For test samples and information on how Armour flotation reagents can increase *your* recovery percentages, describe briefly the separations in which you are interested and send this coupon to the address below, today.

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Specialists in Flotation Chemicals

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Bigger, faster loads with the new LOWBOWL SCRAPERS

18 CU. YD. STRUCK
25 CU. YD. HEAPED

How Caterpillar's new, exclusive LOWBOWL design pays off for you!

Compare these two scrapers – the new No. 470 with LOWBOWL design and the sideboarded No. 21.

Both scrapers were loaded with the same material under identical conditions.

Result: the No. 470's net load weighed 5000 pounds *more* than the load in the No. 21–which is a profitable margin in favor of LOWBOWL design.

The LOWBOWL concept features a bowl that has been widened and lengthened, and bowl depth has been decreased. Incoming material, meeting less overhead weight and internal friction, is loaded with less resistance clear out to the end of the loading cycle.

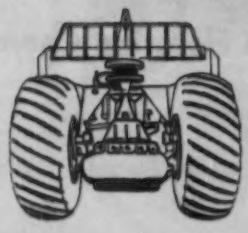
Result: faster loading for LOWBOWL design. Both the No. 470 and No. 456 feature this new concept in scraper engineering.

New No. 470 Scraper (left) with 5000 pounds more load than sideboarded No. 21 Scraper (right).

"BIG PRODUCTION" FEATURES

MORE POWER—300 HP at 1800 r.p.m. Ten per cent more rimpull. New 6-cylinder Cat Engine. Requires only one operating adjustment. Fan-belt tension regulated by convenient setscrew-adjustment of generator.

NEW TURBOCHARGER, driven by engine exhaust, utilizes energy which would otherwise be lost. Packs air into engine according to engine load, not speed. Delivers more working HP—greater performance.



NEW, BIG WIDE-SECTION 29.5-29 TIRES, developed after 3 years of Caterpillar and tire manufacturer research on actual earthmoving jobs, operate at lower pressures and provide greater flotation and traction.

LARGE AREA PUSHBLOCK gives better pusher contact, faster loading.

More power, bigger capacity in the new DW20-DW21 TRACTORS

THE NEW FOUR-WHEEL CAT* DW20 Series E with new No. 456 LOWBOWL Scraper. Also available with the new W20 Wagon; capacity—20 cu. yd. struck. The new two-wheel DW21 Series C is available with the new No. 470 LOWBOWL Scraper.

In the DW20 Series E and DW21 Series C, Caterpillar offers you two new tractors and matched scrapers with exclusive LOWBOWL design.

Replacing the DW20 and DW21, world-famed earthmoving pace-setters, these new machines are built to deliver a new standard of money-making performance.

Their new LOWBOWL design utilizes maximum tractor and pusher power for bigger loads, faster loading times. Their greater power means faster cycles.

For complete facts, see your Caterpillar Dealer!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

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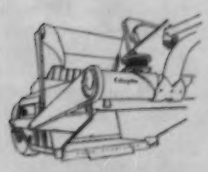
NEW DW20-DW21, LATEST EXAMPLES OF LEADERSHIP IN ACTION

OF THE NEW DW20-DW21



INCREASED HIGH APRON LIFT provides faster ejection of any material.

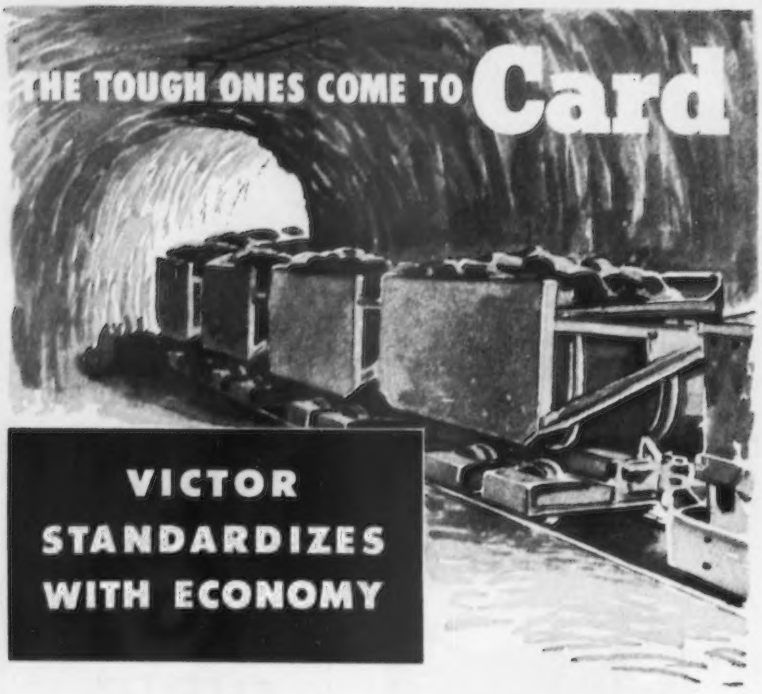
INCREASED SCRAPER GROUND CLEARANCE enables units to work even under extremely "soft" conditions.

HIGH SPEEDS FOR FAST HAULS
DW20 Series E, 2.8 to 32.1 m.p.h.
DW21 Series C, 2.3 to 20.5 m.p.h.

CHOICE OF STARTING METHODS, optional 24-volt direct electric or gasoline starting engine with 6-volt starting motor.

AUTOMATIC CABLE SAVER, standard equipment.

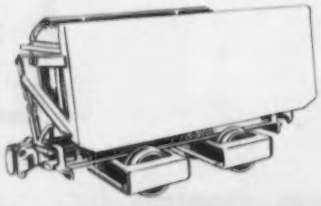
PLUS IMPROVED BRAKE CONTROL, more easily removed DW20 hitch arrangement, better protected DW21 hydraulic steering system and many other new and thoroughly tested Caterpillar features.



The Maiden Rock Mine of Victor Chemical Works first started using Card cars in 1950. Chosen design was a Granby type car of 57 cu. ft. capacity built on 24" gauge and featuring coil spring suspension. The phosphate rock being handled is relatively clean to handle, and the car design is unusually well suited. As a result, not a single Card car has ever had any significant repairs although some wheels have been replaced. Fifty-two of these cars are now in service, representing several re-orders over a four-year period.

Much of the haulage at Maiden Rock is underground, and many of these Card cars seldom see the light of day. The steady day in, day out service record of the cars has meant high production with remarkable economy for Victor—one of the three largest producers of elemental phosphorus.

Standardize your haulage with an economical Card design. Our engineers can furnish an efficient car to meet your most difficult specifications.



C.S.Card Iron Works Co.

2501 WEST 16th AVE.
DENVER, COLORADO

Kennecott Columbite *(Continued)*

mine and concentration plant.

Property is located in West Africa in the Highlands of Nigeria and has been producing approximately 600,000 lb of columbite annually.

IN THE U. S.

ALASKA

Old Homestead Mining Co. gold lode property at Bluff has been optioned by Clayton Exploration Co. of Minneapolis. C. R. Rasmussen, mining engineer, has been examining the property for the company. If the sampling results turn out as expected, they will have a crew on property next spring to put it into operation.

Kenai Chrome Co. recently shipped 4,000 tons of chromite ore from mine on the Kenai Peninsula in Red Mountain area. A second shipment for this season is expected in November.

Claim holders of the uranium property near William Henry Bay on Lynn Canal have taken a small drill to the prospect for testing of the radioactive material at depth.

ARIZONA

Pima Mining Co., now jointly owned by Cyprus Mines Corp., Union Oil Co. of California and Utah Construction Co., has hired Utah Construction to remove 200 ft overburden from its low-grade copper deposit in Twin Buttes district of Arizona.

Actual production of ore and copper concentrates is expected early in 1957, with concentrates to be shipped to a smelter.

Concurrent with stripping operations, design and construction of plant facilities to treat at least 2,000 tpd will proceed. Work will be performed by Utah Construction as prime contractor.

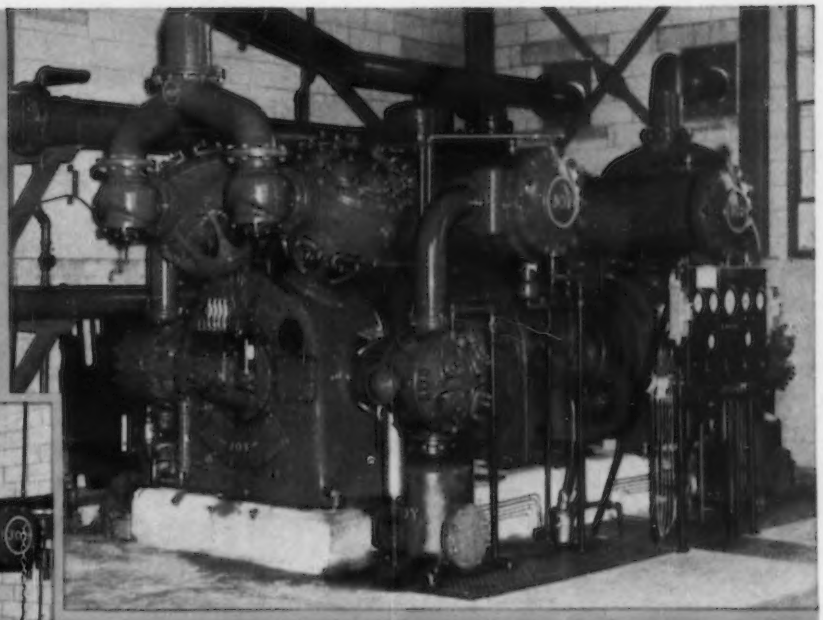
Sulphide ore occurs at roughly 300 ft below surface and is overlain with a 50-ft-thick zone of oxidized copper. Above this and extending to the top of the bedrock is a 50-ft zone of barren, leached rock.

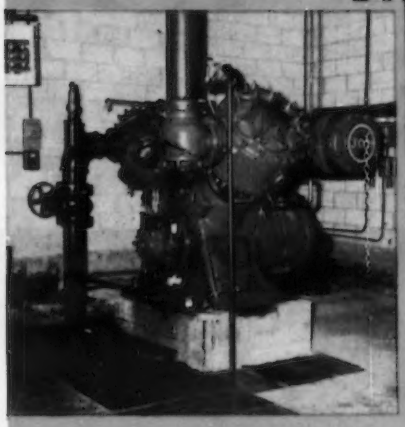
Drexel Spaulding, who served as resident manager during the exploration and development phases, will continue in that capacity. Paul W. Allen, formerly plant manager of National Lead Co.'s MacIntyre Development in New York, has been elected vice president and general manager of Pima. He also has joined the staff of Cyprus Mines and will be responsible for that company's operations at the Copper Queen and Old Dick mines near Bagdad.

Torquoise Mine, once owned by Tiffany's, New York jewelry firm is being reopened as an open pit operation by Lionel Hegert of Tucson. Mine is located in Cochise County in southern Arizona and torquoise has been found as deep as 60 ft.

WN-114—Large metal mine installation, typical of Joy compressor installations at many modern large mines.

WN-112—Typical installation at an eastern lead-zinc mine, one of the many WN-112's in smaller mine service.





JOY LOW MAINTENANCE AIR COMPRESSORS

keep drills, slushers and mucking machines working

HERE'S WHY:

- Honed, field-replaceable crosshead and cylinder liners.
- Exclusive "Dual Cushion" Valves—large area, low lift.
- Factory assembly and testing to insure permanent alignment.
- One-piece, box-type finned crossheads.
- Full force-feed lubrication.
- Precision crankpin and crosshead pin bearings.

The Joy WN-114 and WN-112 are heavy-duty, two-stage, double-acting package-type compressors with displacement capacities from 368 to 3896 CFM. Other stationary compressors are available with capacities as low as 1.2 CFM and pressures from 30 to 600 psi. Ask Joy for an air-power survey of your mine. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

for AIR COMPRESSORS, ROCK DRILLS, HOISTS AND SLUSHERS

JOY

WBD MB405

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

INTEGRAL TYPE — Designed for production drilling, the Integral Type is used in combination with the CP-32 AW Sinker for general Airleg work and the CP-59W Sinker for the harder formations and deep-hole drilling. Available with feed cylinder of aluminum alloy. Has push button release at both ends of the sinker handle.

these two CP

ATTACHABLE TYPE—Converts standard CP Sinkers for lateral or overhead drilling. Used with the CP-39 Sinker for soft to medium formations; the CP-32A Sinker for general Airleg work; the CP-59 Sinker for hard formations or deep-hole drilling. All sinkers recommended for use on Attachable and Integral Airlegs are available with optional hooded front head that reduces weight and prevents chuck spray.

Airlegs make every bit count!

That's right! CP Integral and Attachable Airlegs get the most out of efficient Tungsten Carbide bits. Here's why: CP Airlegs' exclusive pressure release type control handle and balanced feed leg apply steady bit pressure even when line pressure or rock formations vary. The leg takes constant recoil shock, holds the drill firmly to the work . . . eliminates slapping and reduces costly bit breakage. An emergency push button instantly releases feed leg pressure. Available in *Attachable* types for conversion of standard sinkers to Airleg operation and in *Integral* types for production drilling . . . both in standard feeds of 36″ and 48″.

Chicago Pneumatic Tool Company,
8 East 44th Street, New York 17, N. Y.

INTEGRAL TYPE is quickly changed over for regular Sinker drilling. Operator simply loosens quick-disconnect nut on the Airleg, dismounts the Sinker and adds his "T" handle.

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

VICTAULIC METHOD OF PIPING

VICTAULIC COUPLINGS

Styles 77, 77-D for standard applications. Simple, fast to install—sturdy and reliable. Sizes ¾" to 30". Style 75 Light-Weight Couplings for light duty applications. Sizes 2", 3", 4". Additional styles for cast iron, plastic and other pipes. Sizes through 60".

VICTAULIC FULL-FLOW FITTINGS

Complete line of Elbows, Tees, Reducers, Laterals, etc.—to fit all Victaulic Couplings. Streamlined for top efficiency, easy to install. Sizes ¾" to 12".

VIC-GROOVER TOOLS

Handy, on-the-job grooving tools that do the work in half the time. Light weight, easy to handle—operate manually or from any power drive. Automatic groove position and depth. Sizes ¾" to 8".

ROUST-A-BOUT COUPLINGS

Style 99 for plain or beveled end pipe. Best engineered, most useful plain end joint on the market. Simple, husky — easy and fast to install. Takes strong bull-dog grip on pipe. Sizes 2" to 8".

VICTAULIC SNAP-JOINTS

Victaulic's new boltless, speed coupling. — Style 78 — hinged into one assembly. Hand-locks for time and dollar savings. Sizes 1", 1¼", 2", 3", 4".

EASIEST WAY TO MAKE ENDS MEET

Promptly available from distributor stocks coast-to-coast. Write for NEW Victaulic Catalog-Manual 55-11C.

VICTAULIC COMPANY OF AMERICA

P. O. Box 509 • Elizabeth, N. J.

Arizona *(Continued)*

Several prominent Salt Lakers have ante'd up $300,000 for a uranium up-grading mill which will be erected by Sterling Uranium Co. at the Cato Sells mine, Apache County. Property is adjacent to Monument No. 2 mine of Vanadium Corporation of America. Salt Lakers include: Sidney S. Fox, TV-figure who recently sold KDYL and KDYL-TV to Time, Inc. in a $2½-million deal; Joseph Dupler, Denver and Salt Lake furrier and investment figure; Calvin W. Rawlings, former Democratic national committeeman from Utah and an attorney; Louis Buchman, retired vice president, Kennecott Copper Corp.; Marion Nelson, president of Gillham Advertising Agency.

Syndicate, which put up $100,000 in cash and pledged an additional $200,000, announced Richard M. Atwatter, Jr., New York mining engineer, had been employed as production manager.

Arizona miners are a fairly stable lot—according to figures prepared by the state department of mineral resources.

Employees of major copper mining companies have established a record for durability. Department's survey shows that 34.4% of workers in the industry have been with their present employers for more than 10 years. And 8.49% have been employed by the same company for 20 or more years.

Percentages were based on a study of employment records of the larger Arizona operations and cover 10,581 employees. As for labor turnover in copper operations, check of one half of the total survey showed a job change of only 0.82%. This compares favorably with the 1.33% monthly turnover reported by all manufacturers on a national basis.

Globe Uranium Ore, Inc., is conducting exploration work in Gila County as part of a $49,285 project—$36,964 of which is under Defense Minerals Exploration Administration contract. Work is in the Globe-Miami-Young area.

CALIFORNIA

Darrel V. Cole & Associates of Apple Valley are building a 100-ton tungsten mill in the Goler district near Randsburg, Kern County. Plans call for the milling of ore hauled from 40 acres of claims near the old Sunshine and Winnie mines, several miles south of Randsburg. An airplane landing strip has been constructed on the tungsten claims. Fred I. Howard of Johannesburg is associated in the mill venture.

Construction of a new all-steel A-type headframe has been completed by Consolidated Western Steel Co. at Western Borax mine's No. 3 shaft in the Borox area of Kern County.

Next project at the mine will be erection of a prefabricated metal building around hoist installation. Development work is in progress in the mine, according to K. C. Richmond, mine manager.

NEW Silco-Flex MOTOR INSULATION

Offers These Amazing Physical Properties

Allis-Chalmers, working with Dow Corning Corporation, has developed *Silco-Flex* motor and generator insulation . . . truly new in concept . . . truly new in effectiveness.

Silco-Flex insulation employs a pure silicone rubber combined with specially developed application techniques to produce an insulation unmatched by any other in use today.

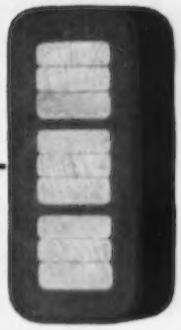
● **Flexibility and Resilience** — *Silco-Flex* insulation remains flexible and resilient indefinitely. It is especially resistant to mechanical abuse and to stresses of overloading, rapid starting and stopping.

● **Moisture Resistance** — Completely sealed, *Silco-Flex* insulated coils are the most moisture-resistant commercial coils ever produced. They are production-tested while submerged in water . . . by far the most complete and searching high potential test used.

● **Abrasion Resistance** — Samples of insulation at right show effects after sandblasting with 90 grit aluminum oxide and 100 psi air for one minute. Nozzle-to-sample distance was six inches, thickness equivalent to 2300-volt insulation. Note difference in abrasion!

Silco-Flex Insulation | Polyester Mica Tape | Asphaltum Mica Tape

● **Homogeneity** — *Silco-Flex* insulation is a void-free dielectric barrier vulcanized into a unified insulating wall. It maintains its homogeneity under extremes of differential expansion and contraction due to thermal cycling.



Other Advantages include exceptionally good thermal stability and chemical inertness. *Silco-Flex* insulation is also a much better heat conductor than ordinary electrical insulating materials. Moreover, enclosures now required to protect windings from moisture and abrasion may be eliminated in many cases.

New *Silco-Flex* insulation is immediately available for all Class H form-wound coils and for Class A and B windings operating under selected service conditions. For complete information, call your Allis-Chalmers representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4774

Silco-Flex is an Allis-Chalmers trademark.

ALLIS-CHALMERS

California *(Continued)*

Verdi Development Co. has acquired the Crystal Dome uranium claims in Lucerne Valley, San Bernardino County, and 16 tungsten claims in the Beauty Mountains of San Diego and Riverside Counties, according to Clifford Gillespie, board chairman. Tungsten properties include a 50-ton mill which Verdi hopes to put into operation in October.

Uranium may play a leading part in reviving old gold mines in the historic districts of California. This is the opinion of some mining men who point to the reopening of several mines, formerly known as gold and silver producers, to search for uranium ore.

Latest of such mines to reopen is the Enterprise mine on Tucker Mountain in the Ahwahnee district of northeastern Madera County. Operators are going in for a program of core drilling to determine the content of the underground showings.

Great Lakes Oil & Chemical Co. has applied for and received clearance from the AEC to make a carload shipment of uranium ore stockpiled at the company's Kergon mine in Kern Canyon, 35 miles northeast of Bakersfield. Shipment will be the first from the mine.

Bob Steele, a graduate of Mackay School of Mines, Reno, Nevada, is directing operations at the Kergon mine.

Controlling interest in Sonoma Quicksilver Mines, Inc, San Francisco, has been purchased by Black Mammoth Consolidated Mining Co., Chicago, and a group of Chicago and Vancouver, B. C. investors.

Move is first venture into the quicksilver field for Black Mammoth, whose interests include oil holdings in Montana and Wyoming, uranium property in Colorado, and a lithium prospect in Ontario.

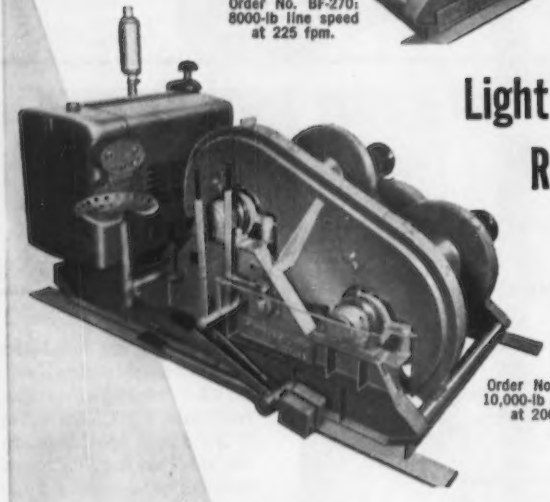
Along with the shift in control, Black Mammoth president J. M. Powelson succeeds H. D. Tudor as president of Sonoma. Three new directors—Powelson, Philip B. Stewart II (a vice president and director of Black Mammoth) and S. Redge Smith joined the five-member Sonoma board. H. L. Hotle and Lindsey Hooper are also directors.

Sonoma operates a quicksilver mine in Sonoma County, near Guerneville, which currently is producing at the rate of 200 flasks per month.

BAND FRICTION HOISTS
Electric, Gas or Steam Drive

- Reversible for wear
- Non-burn lining
- "Face forward" friction & break levers
- Anti-friction bearings

Order No. BF-270: 8000-lb line speed at 225 fpm.



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COLORADO

Charles A. Steen and associates in Utex Exploration Co. and Moab Drilling Co., both Steen enterprises, have purchased for undisclosed sum fluorite deposits in Chaffee and Jefferson Counties.

Andrew McGill, Utex vice president, said company has no immediate mining plans, although deposits have been delineated by core drilling.

Seller was Frank A. Mansheim, Salida, Colo., who said deposits were located in Brown's Canyon and Pochna Pass, Chaffee County and in Jefferson County.

T. R. Gillenwaters was re-elected president of Uranium Engineering Co., Grand Junction, at the annual stockholders meeting in August. Ed Strand was elected secretary-treasurer and general manager. Stockholders authorized officers of the company to sell any or all assets.

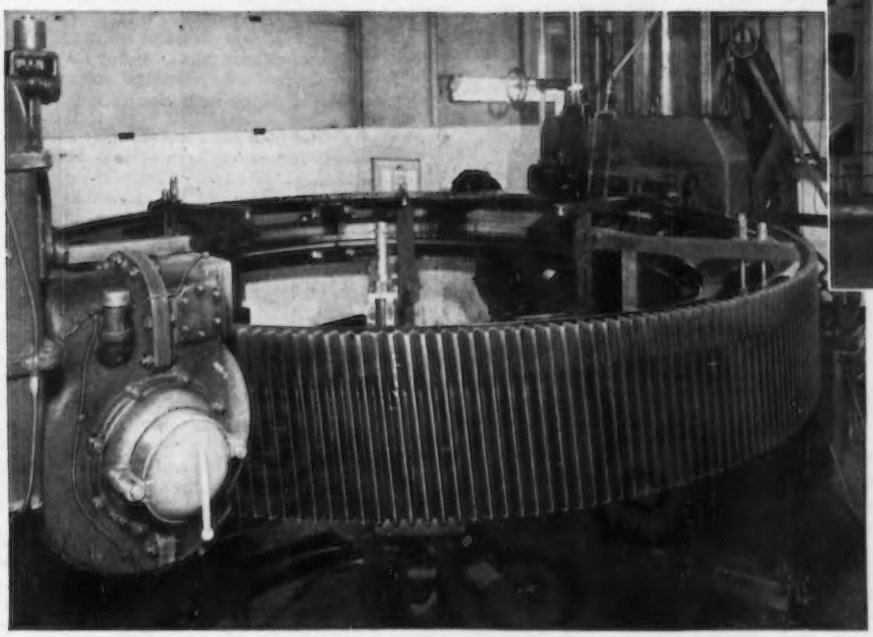
Over 31,000 acres of land in Mesa and San Miguel Counties, Colo., and Grand County, Utah, will be restored to mining claim location Jan. 18, the Grand Junction Operations Office of the AEC has announced. Withdrawn by the AEC in 1948 and 1951, the land has yielded no substantial uranium deposits.

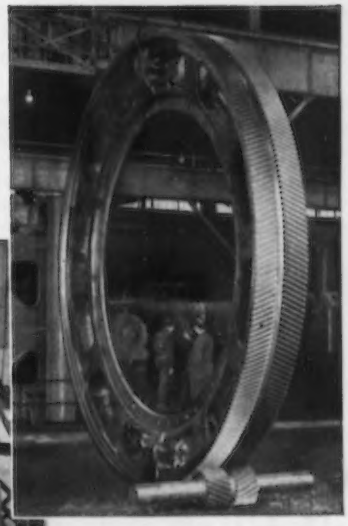
Areas to be restored include 2,720 acres in Gateway district of Mesa County, Colorado; 920 acres in San Miguel County, Colorado, and 27,679 acres in Grand County, Utah.

New Idria Mining & Chemical Co. a Nevada corporation with offices at Idria, Calif., has entered the uranium field with purchase of a number of claims from Don Danvers, of Grand Junction. Purchase price is reported at $950,000. According to company officials, transaction was part of a planned expansion and culminated a full year of research on uranium properties.

Gears by FALK

. . . a good name in industry





ABOVE: In foreground, split ring herringbone gear, 16¾ feet in diameter. In background, a single helical gear is being rough-cut on special hobbing machine (which also can cut herringbone or spur gears).

LEFT: Split ring gear receiving final cutting on special hobbing machine, designed and built by Falk. It is operated in a temperature-controlled room to minimize dimensional variations.

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As the country's largest supplier of precision gearing, Falk is the manufacturer best equipped to *recommend without prejudice* the exact gear most suited to your specific application. Whatever type gear your job demands—single helical, herringbone or spur—Falk has unsurpassed facilities to engineer and produce it.

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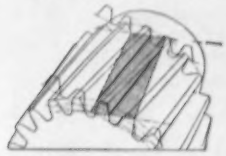
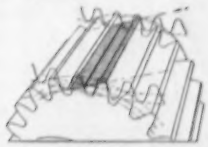
GEAR FACTS FOR ENGINEERS

The greater capacity of Falk Helical Gears, whose teeth are cut obliquely across face, is shown by the sketches below. When helical gears mesh, two or more teeth are always in contact; they share the load. Result: maximum contact area, greater capacity and strength.



By contrast, on gears with teeth cut straight across the gear face (as in spur gears), there are alternately one or two teeth in contact when gears mesh. Result: Very small contact area. The load-carrying capacity (rating) is determined by minimum contact conditions when but one tooth sustains the load.



On the basis of comparative sizes of contact areas of the two gear types, the high capacity of helical gears over competing types is apparent. Engineers, operators and maintenance men who have experienced the advantages of Falk Helical Gears are unwilling to "settle for less".

Colorado *(Continued)*

200-ton uranium processing mill will be constructed in Steamboat Springs, it was announced at the regular town board meeting by Raymond O. Reichard, president and general manager of the Three Forks Oil & Uranium Co. Firm recently set up an office and assay service in the Rehder Building at Steamboat Springs and plans to process uranium ore from a wide area in a new mill here, Reichard said.

American Uranium of Lake City, Colo. and Moab, Utah, reports it completed the first phase of development on its North Henson Creek properties known as the Eagle and Mary Alice group. Many promising surface outcrops were explored which show high uranium and a shaft has been sunk to a depth of 30 feet, which is still in commercial ore.

Farmington Funding Corp. of Colorado Springs reports it has made a rich uranium strike on Ralston Creek, eight miles west of Golden. Marvin C. Chase, director of the firm's mining division, said the discovery showed a vein of pitchblende ore 58.8 feet wide containing uranium oxide testing 0.62%.

Beaver Mesa Uranium, Inc., reported total production of 1,694.42 tons of uranium ore during August, with a gross revenue of $118,961.05. Production was from the South Pack Rat drift and the 430-ft Cherokee shaft.

In addition, work was underway in early October on a 350-ft shaft to the Rajah No. 28 orebody, estimated to contain more than 41,500 tons. Shaft, being sunk by Eugene Bishopp of Grand Junction, will require about 2½ months to complete, said president Robert E. Simpson of Beaver Mesa. Bishopp is using a new shaft sinking method utilizing elliptical concrete ring construction.

Carter gold mine at Ohio City in Gunnison County has been opened with W. F. Kelsey, manager. Carter mine, owned and operated by the Kanarado Mining and Development Co., a Colorado corporation, produced gold, silver, lead and zinc. Mine was originally opened about 55 years ago, Kelsey said, but has been shut down for the past five years.

A rich uranium, thorium and rare-earth strike is reported in Greenhorn mountains, east of Westcliffe and about 25 miles from the nearest uranium operations in Huerfano County. Francis Petry, of Pueblo, and four associates, said their find has been termed "one of the best in the country" by experts of the U.S. Geological Survey.

Shiprock Uranium has purchased the Jump tungsten mine, located a few miles out of Boulder, from the Jump Mining Co. This is a tungsten producer and has a history of mining tungsten for intermittent periods of time since 1901. Property consists of five patented claims, seven miles west of Boulder. Shiprock assumed control of the property Sept. 1. Ore reserves have reportedly been evaluated at $875,000 net after milling.

First car of lead-zinc, silver-gold ore to be shipped out of Aspen this year was loaded at the Aspen siding by the Antimony Mine, which is located near Italian Mountain just over Taylor Pass, 21 miles south of Aspen. Jack Bryan of Silt, who has a lease on the property, announced that the car of fairly high grade ore is being shipped to the smelter at Midvale, Utah. He expects to ship at least a car of good ore each week until the weather closes down operations at that high altitude (above 12,000 ft).

Three truckloads of sacked uranium concentrates and ore left United Mining & Leasing properties at Central City recently for Monticello, Utah. Shipment, third of uranium to leave Gilpin County in recent years, was the second made by United. Mill ore had been hoisted from the Carroll and Two Sisters mines just west of Central City, according to manager Claude R. McKay. Concentrates were the result of a new milling process by Floyd Campbell, UM&L mill superintendent, in the leased Black Eagle mill near Idaho Springs. Company has been busy putting the Boodle mill in shape and replacing the old equipment with other machinery to provide a 50-ton mill.

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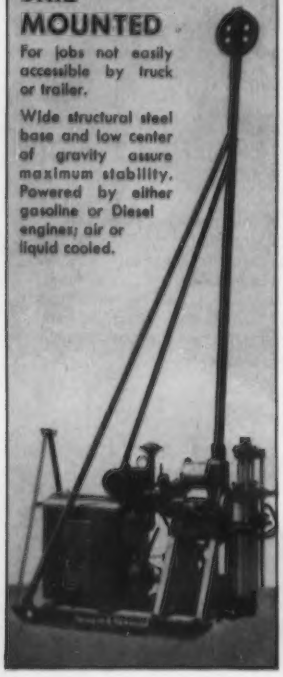

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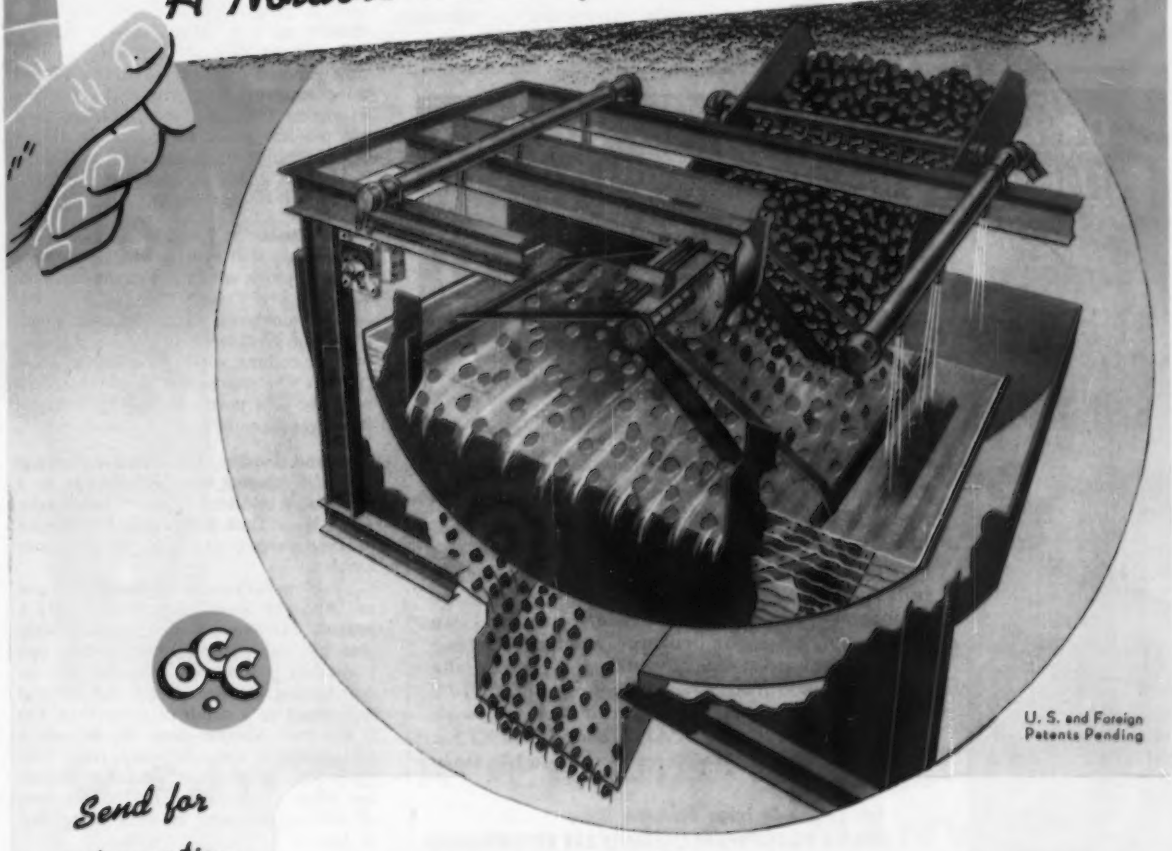

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IDAHO

J. R. Simplot Co. of Boise plans to start production about the middle of next year from vast phosphate rock deposits it has developed in the Centennial Mountains on Idaho-Montana border. Exploration work since 1950 has established presence of substantial deposits of acid-grade material on approximately 3,600 acres in Clark County, Idaho, and Beaverhead County, Mont. Initial production will be by open-pit methods, but eventually mine is expected to go underground.

Anaconda Co. reported recently that it is working on plans for construction of a multi-million dollar plant to produce alumina from the vast domestic clay resources in the Moscow-Pullman area of west central Idaho and southeastern Washington. Laboratory research on an adaptation of the Christensen process, involving acid leaching of the calcine clays, has proved encouraging and it is believed that alumina can be produced on a large scale at a price competitive with foreign and domestic bauxite; if an adequate supply of natural gas (between 25-million and 40-million cu ft daily) is made available through proposed pipeline facilities now under consideration.

Anaconda Aluminum, a subsidiary which recently put into production a big reduction plant in western Montana, would be the operating company. A pilot plant may be built. Alumina has not yet been made commercially from clay. Officials at Anaconda Aluminum have denied knowledge of plans to erect the recovery plant in above area.

Mascot Mines Inc. has a program of deeper development underway at Pine Creek Lead-Zinc Mining Co.'s Little Pittsburg mine in the Pine Creek area southwest of Kellogg. A station and pockets have been completed on the 600 level and southerly crosscutting is now in progress to open downward extension of the Little Pittsburg vein, in hope of finding higher-grade ore than now exposed in upper workings. Present mine reserves, estimated at 54,000 tons averaging 7% combined lead and zinc, are too low grade for economic mining under existing price and cost conditions.

Mascot Mines operates the property under a lease agreement.

Idaho Goldfields Inc. has installed a 15-ton Brickly mill at its lead-zinc property in the Fourth of July Canyon between Kellogg and Coeur d'Alene and has built a bunkhouse for six men in anticipation of continuing operations throughout the coming winter. Production from the 4-ft vein exposed in the incline shaft near the adit portal is scheduled to get underway as soon as a jig is installed.

Highland-Surprise Consolidated Mining Co. is developing what promises to be a major zinc and lead producing enterprise at its Deer Trail property in the Fourth of July Canyon of Custer County near Stanley.

Initial underground exploration, begun on Aug. 15 under a $59,570 DMEA project, has exposed a 40-to 50-ft wide zinc ore zone about 100-ft below, and some 200 ft south of, the equally wide outcropping exposed at the surface and drill-tested to a depth of more than 300 ft last year. Samples from the deposit, a replacement in dolomite, range from 7- to 13% zinc, with minor amounts of lead and silver. Approximately 300,000 tons of ore are indicated by work completed so far.

Next objective of the new exploration crosscut is a parallel structure about 170 ft to the east of the zinc vein. Surface exposures show a 6- to 12-ft width of predominantly lead ore, also a replacement in dolomite. Samples from a 6-ft width assayed 10.3% lead, 8.8% zinc and 2.4 oz silver per ton.

Sunshine Mining Co. is a partner in the enterprise under a profit-sharing agreement which provides that Sunshine provide all funds for the operation, including payments due on the property, without reimbursement until its investment equals Highland's expenditures prior to July 1, 1955, plus credits allowed Highland for the equipment it has supplied. Sunshine's outlay over and above this amount is reimbursable out of 80% of first profits from production, with the remaining 20% being divided equally between the partners. After Sunshine has been reimbursed, profits will

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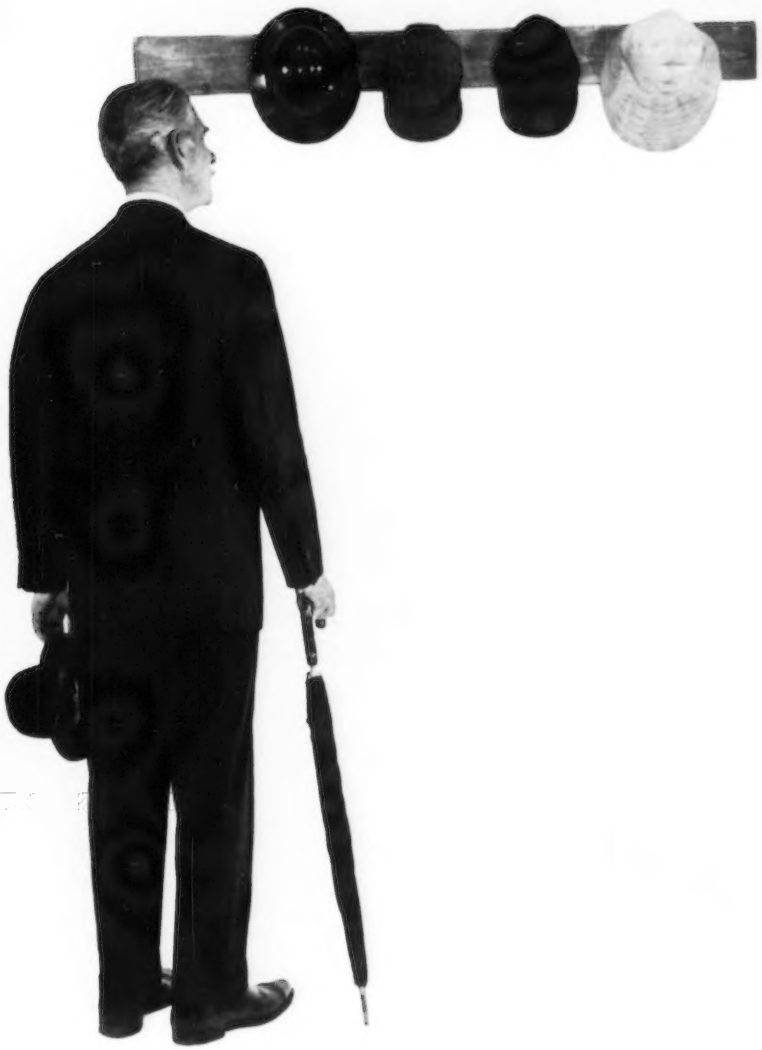

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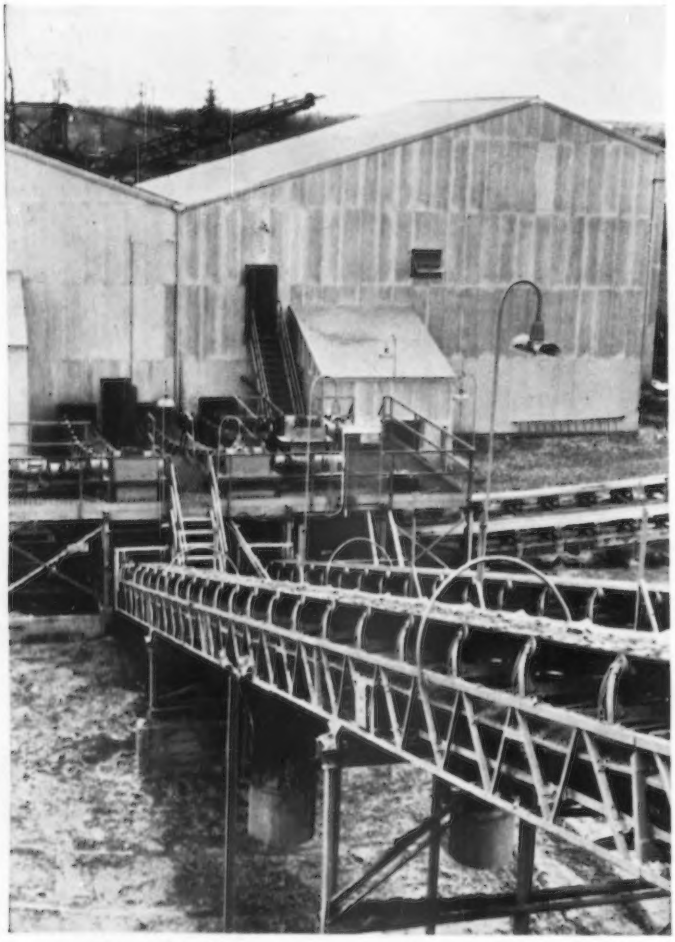
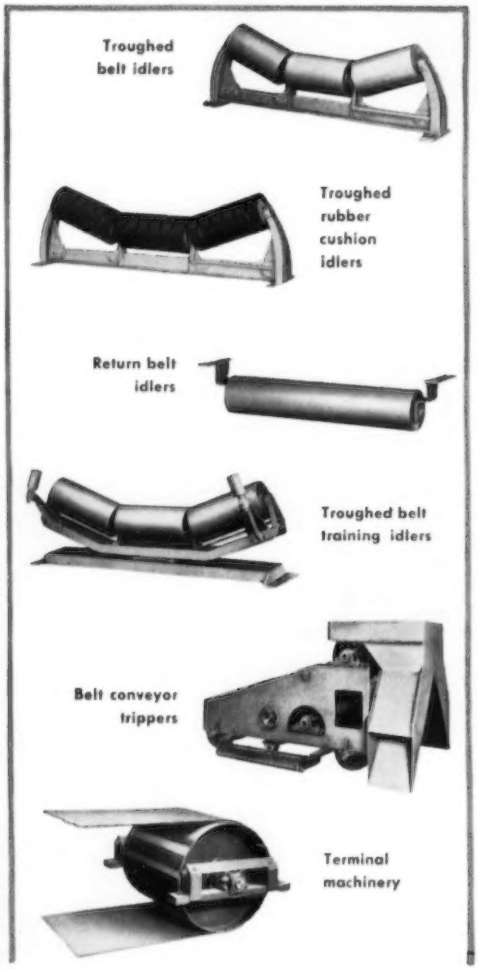


Link-Belt 30-in. wide belt conveyors handling iron ore concentrate and tailings from washing plant to railroad and truck loading hoppers.



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THESE four mining companies—all in different parts of the country—have one thing in common: they're saving money through the outstandingly long service they get from B. F. Goodrich tires.

The Colonial Coal Co. in Kentucky reports 125,000 miles and 3 recaps from Universal tires. Clinchfield Coal Corp. in Virginia often got only 30 days' service from other makes of tires, reports B. F. Goodrich tires can be recapped. "BFG tires are better than any we've ever used," says Pittshaw Trucking Co., Pennsylvania coal hauler. And down in Oklahoma, the Mining & Smelting Division of Eagle-Picher Co. reports recaps give 75% of original mileage.

All-Nylon body

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Idaho *(Continued)*

be shared equally.

Highland acquired Deer Trail property in fall of 1954 under lease and purchase option. It consists of three groups, the Deer Trail, Confidence and the F.D.R., totaling 20 claims and two millsites. An additional nine claims and two millsites were acquired to round out the property. Geological evidence indicates that the two big ore structures traverse a large part of the property. There are also a number of small parallel veins containing good lead and zinc mineralization.

Hecla Mining Co. started limited production of uranium ore from the Radon property in the Big Indian District of San Juan County, Utah, during September, after completing new three-compartment shaft to a depth of 690 ft. Initial output was from development drifts and crosscuts being driven at 600 level to prepare the orebody for mining. At full production property is to yield about 250 tpd.

Hecla operates the property under a profit-sharing agreement originally signed with U. & I. Uranium Inc., of Kellogg and subsequently turned over to Federal Uranium Corp. of Nevada in a merger deal. Hecla's share is 21.25% of net smelter returns.

Sun Uranium Co. of Salt Lake City has taken a lease and option on the Chris Peterson property adjoining the Snoose mine in Blaine County and has moved drilling equipment up from Moab, Utah, to explore the ground. Company is also reported to be negotiating for three other properties in the Hailey area.

The third test hole drilled by National Uranium Corp. on its two-claim Mountain Lion group in the Big Indian District of San Juan County, Utah, has penetrated nearly 30 feet of mineralized structure at a depth of about 700 ft. A drill-log of the hole shows intensive radioactivity from the 702- to the 730-ft level. Hole No. 2, about 180 ft to the west, intersected only about three ft mineralization. There are good geological indications that mineral zone is improving as it trends toward east and further drilling in this direction is now planned and will get underway as soon as access roads to new drilling sites have been completed. National Uranium is developing the property under a 60-40 profit-sharing agreement with Silver Buckle Mining Co.

MINNESOTA

During the ore season M. A. Hanna Co. carried on intermittent rock stripping at its Cooley district mines, the Mississippi group, the South Agnew, Morton, Enterprise, Douglas, Weggum and Cuyuna range mines. In addition, exploration work with 27T and 29T drills was conducted at the Cooley district and Morton mines and structure drilling at the Mississippi group and Perry mines.

Stripping operations at the new Parcel Three mine have been pushed on a 20 shift per week basis. An approach road to the pit is being graded and the truck haul road has been completed. A service garage is under construction.

Operations at the Sherwood mine of Inland Steel Co., which were suspended on July 26 because of a stope cave-in at the Spies mine of the Cleveland Cliffs Iron Co., have been resumed. Massive concrete dams and bulkheads have been placed in the Spies which are designed to hold back any further influx of water from the caved stope. A great amount of clean up work was necessary in the Sherwood before mining could be begun; and numerous pumps were brought in, not only from nearby mines, but from Caland Ore Co., Steep Rock and Calumet & Hecla to accomplish the unwatering of the Sherwood.

North Range Mining Co.'s Book underground mine at Alpha, on Sept. 25 stepped up its mining operations to seven days per week for the remainder of the 1955 shipping season. Surplus pile at the mine's washing plant was running low. Company's Warner mine at Amasa is still on a five day week basis. Several other mines on Gogebic range are operating on a six day week.

North Range has finished mining oper-

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These Simplicity vibrating pan type feeders have proven themselves throughout the mining and quarry industry. They are not only handling various types of stone and aggregate, but the extremely abrasive taconite ore.

Lower maintenance costs have been proven by long experience in the field. The simplicity of the pan construction allows the unit to be easily repaired with existing materials. These feeders are available with replaceable liners of abrasion resistant steel. The oscillating action is provided by two eccentric shafts coupled to a single V-belt drive . . . leaving only one assembly and four bearings to lubricate.

The Simplicity Os-A-Veyor feeders are self-cleaning units. They experience none of the return spillage found in apron feeders. The Os-A-Veyor feeder will discharge material with a minimum fall, the height of drop is not determined by the size of a sprocket. The units are designed to handle heavy column loads. Overloading the feeders causes no damage, as there is no mechanical connection between the eccentric drive and the main frame or bin.

The Simplicity Os-A-Veyor feeders are main frame supported, or can be supported from the bin with spring and cable suspension, eliminating the need for separate concrete foundation. Sizes available range from 1′ x 4′ to 6′ x 20′ with capacities to 1000 tons per hour.

169

If you wish further information on Simplicity Os-A-Veyor feeders, grizzly feeders, horizontal screens or gyrating screens write . .

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FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario
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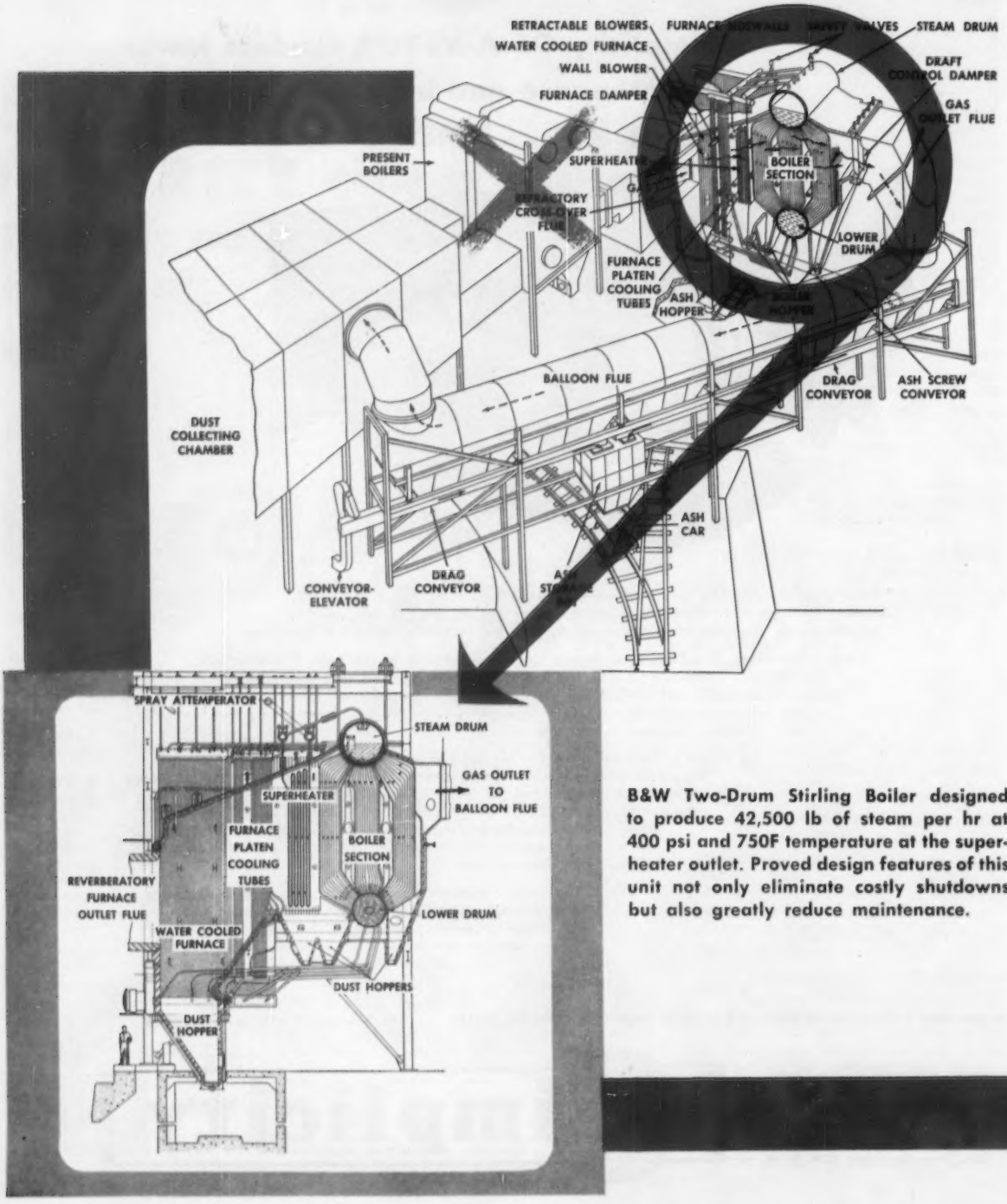
In Metallurgical Plants with B&W Heat-Recovery Systems

production is up -



B&W Two-Drum Stirling Boiler designed to produce 42,500 lb of steam per hr at 400 psi and 750F temperature at the superheater outlet. Proved design features of this unit not only eliminate costly shutdowns but also greatly reduce maintenance.

- maintenance costs down

When dust-laden flue gas from reverberatory furnaces causes frequent forced shutdowns of the waste-heat boilers that follow the furnaces in metallurgical plants, there is high reverbaratory furnace maintenance due to heating and cooling of the refractory, and serious production losses that are extremely costly. A case in point is that of a Chilean copper producing plant, where inadequate provision in the waste-heat boiler design for coping with high-temperature dust-laden flue gas resulted in frequent shutdowns, causing loss in production and high operating labor cost.

The remedy for this condition is the installation, soon to be made, of a B&W Two-Drum Stirling boiler, arranged to serve the same reverberatory furnace, with proved steps in design being provided to eliminate shutdowns. These are: provision for effective cleaning by automatic soot-blowing equipment, and suitable water-cooled furnace arrangement to cool the dust-laden gas sufficiently to prevent fouling of the superheater and boiler heating surface.

The boiler is designed to generate 42,500 lb steam per hour, at 400 psi and 750F steam temperature at the superheater outlet. The steam temperature is controlled by means of an attemperator designed to prevent the steam temperature from exceeding a pre-determined maximum value, for the protection of the steam turbine and steam-driven auxiliaries in the power plant.

The waste-heat boiler will be connected to the dust settling chamber by a suitable balloon flue, designed to promote maximum dust recovery and its disposal by mechanical means. The complete assembly of heat-recovery boiler, connecting flue, and dust-conveying equipment is shown by the schematic drawing.

The knowledge accumulated through B&W's long experience with operating procedures and facilities in the copper smelting and refining and related fields, was invaluable in the development, manufacture, and operation of this system, which includes not only mechanical equipment but also automatic control of all operations. This same experience, and B&W's complete facilities, are available for the solution of other problems common to these fields. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

BABCOCK & WILCOX

BOILER DIVISION

G-711

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Welders connect to any standard AC or DC welding machine. You weld by hand and you can see what you're welding at all times. You'll get uniformity, good bead appearance, high weld quality—and you don't need any special skills to get the desired results.

HOW IT WORKS

The Amsco MF Welder uses a coiled, bare mild steel electrode. It feeds continuously under automatic regulation through the flux hopper. There it is magnetically coated with your choice of manganese steel build-up or hardfacing alloy which is carried in the flux. It coats the electrode as you weld at considerable savings in speed and deposit cost.

Your Amsco Distributor is ready to show you now . . . or write

AMERICAN MANGANESE STEEL DIVISION

AMERICAN Brake Shoe COMPANY

Chicago Heights, Illinois

Minnesota (*Continued*)

ations at the Blueberry underground mine on the Marquette range.

Manthe Mining Co., new company owned by Youngstown Sheet & Tube Co.; Stelco Coal Co. and Interlake Iron Corp., took over West Davis and Geneva underground iron ore mines from Oliver Iron Mining Division on Oct. 1.

An employee of Jones & Laughlin's Hill-Annex mine at Calumet has received an award of $3,210 for his improvement suggestion in the concentration. This was second largest award received by an employee during the three years suggestion plan has been operative. 40,000 employees are eligible to offer suggestions. Employee, Thomas J. Reed, was honored at a dinner held in Pittsburgh on Oct. 13 where he was also presented with a $1,000 war bond by Admiral Ben Moreell, board chairman.

Oliver Iron Mining division has informed the city of Virginia that it expects to begin mining its last major high grade iron ore reserve within a few months. This is the Sauntry mine which contains around 30-million tons. For the last ten years some shipments have been made from the Sauntry by Columbia mine of Jones & Laughlin Steel Corp. and Enterprise mine of the M. A. Hanna Co., adjoining properties.

Reserve Mining Co.'s big taconite plant at Silver Bay, where much of the machinery has now been installed, has reached the stage where testing of the many equipment units is being conducted. Construction work is being rushed on pelletizing building and connecting facilities.

Tioga No. 2 mine of Western Mining Co. (P.M.&Co.) made its first shipment of ore on June 7. Mine is located southwest of Grand Rapids on Pokegema Lake. It is Mesabi range's most westerly operating mine containing an estimated tonnage of 5,154,323 tons.

MONTANA

First shipment of manganese ore from a mine south of Alder, Madison County, was made in late August by Joe Lopez and John T. Marcale. Ore was shipped to the mill of Domestic Manganese & Development Co., in Butte.

Lexington Silver-Lead Mines, Inc., operating a lead-zinc-silver mine in the Neihart district, Cascade County, has acquired uranium interests in Spokane, Wash. area and in Montana, according to James A. Allen, Spokane, president. It has leased 2,000 acres adjoining Mammoth Uranium Prospect in Jefferson County near Clancy. At the lead-zinc mine near Neihart, ore is being stockpiled until new 125-ton flotation plant is ready. Old mill was destroyed by fire two years ago.

Uranium ore reportedly has been discovered in the Pryor Mountains of south central Montana, about 40 miles south of Billings, by Walter A. and William E. Coyle, both of Missoula, and Walter Dean Jr., of Forsyth.

It is reported that Mitchell Mining Co., operating the Marget Ann Mine, north of Walkerville in the Butte area, has encountered a segment of high-grade gold and silver ore. Company has completed sinking its main shaft to 550 ft and has been prospecting its lowest level. Last year the company built a 100-ton mill, which is expected to be put on a 3-shift basis as quickly as the lower level is producing.

In development work carried on by Oro Mining Syndicate, Kellogg, Idaho, and Silver Star Mines, Inc., Wallace, Idaho, on the 3-claim St. Paul property near Libby, Lincoln County, substantial ore reserves above the No. 3 adit have been opened, according to A. L. Osborn, president of Oro.

This new development heading has been advanced 110 ft in ore averaging about 1½ ft wide and carrying combined lead-zinc values of 40 to 50%, with about 3 oz silver per ton. Vein width has been improving as heading progresses and there still remains 90 ft of tunnel to be driven to get underneath the best ore exposure on No. 2 level, which is about 110 ft higher than the No. 3. Silver Star is financing work under an option contract to purchase a half interest in claims for $12,000.

NEVADA

M and L Rare Earths and Minerals Refining Co. have obtained contract to furnish the U. S. Bureau of Mines' Reno experiment station with undisclosed amount of rare earths elements.

Firm, which during last two years has spent several thousands of dollars on experiments in reduction of the earths into component elements, would only say that it had perfected this process to five steps.

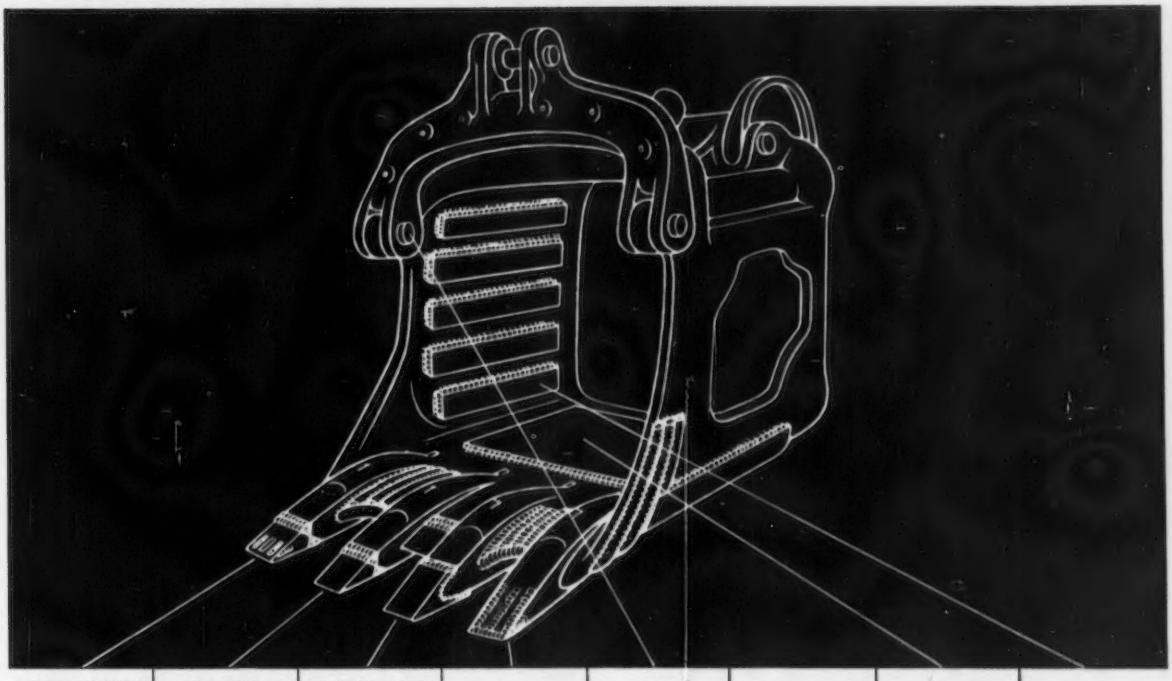
Simplot Iron Co., an Idaho corporation, has resumed shipments of iron ore from the deposits on the Moderelli lease south of Palisade in Lander County. Site is near rail lines, and large amounts of ore are being hauled from the mine and loaded daily. James Lynch, Western Pacific superintendent for the Elko division, reports that Simplot has orders for 140,000 tons of iron ore to be shipped to Japan.

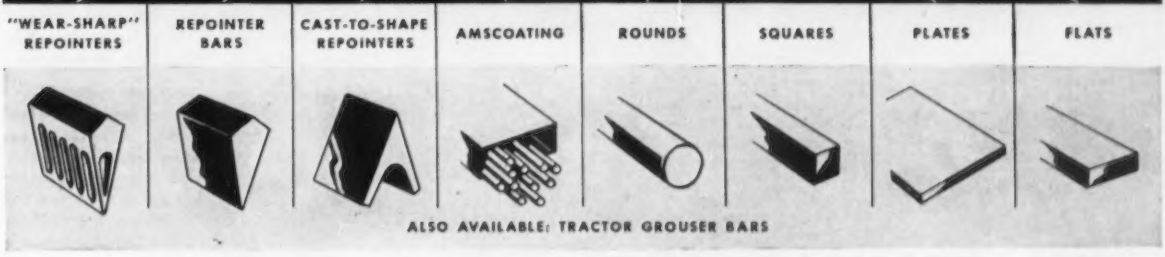
Cordero Mine in northern Humboldt County more than doubled its output during the second quarter of 1955, to hold its position as one of the nation's largest producers of quicksilver. The report was issued from the office of U. S. Senator Alan Bible.

Getchell Mine, Inc., which operates in northern Humboldt County, during the first six months of 1955 milled a total of 179,056 tons of tungsten ore, of which 97,871 tons were company ore, 12,605 tons custom ores, and 65,580 tons milled on a fee basis.

Star Point copper mine, near Kyle's Hot

For EXTRA TOUGH build-up and repair





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Amsco also produces other alloy steels with maximum wear-resistance under particular service conditions . . . and a complete line of hardfacing welding equipment, both rods and machines.

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Chicago Heights, Ill.

Nevada *(Continued)*

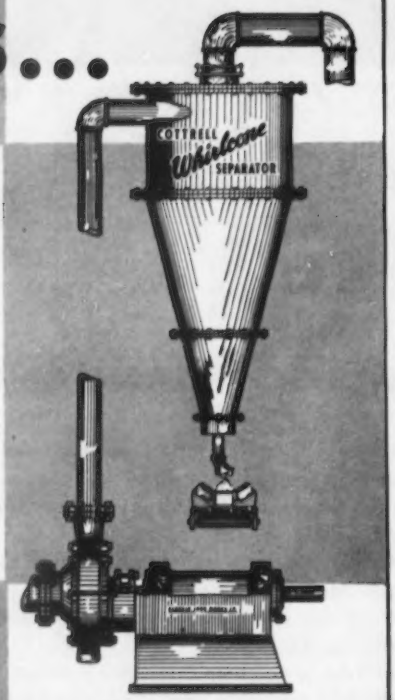
Springs in Pershing County, is making daily carload shipments of ore. Kenneth Cross, of Baker, Ore., is in charge of the operations, having recently bought the property from Charles Chester, of Burbank, Calif.

Following a successful dewatering project, L. F. Emigh, Frank Muehl and M. Wolfenstein are developing and producing gold and silver ore from the old Silver Leaf mine 20 miles east of Tonopah. Property had lain idle for 20 years and water had risen in the 285-ft shaft. The three developers are employed by the Federated Minerals Co., a South Dakota concern which recently acquired the Silver Leaf property from Mrs. Myra Richardson and Jess Crain.

United Mercury Co. has completed an extensive development program at its property in Lander County, and is now producing quicksilver. Roads were built, housing facilities erected, a water system was installed, ore bins built, and conveyor belts put in operation. The kiln is now processing ore that was stockpiled while the development work was in progress, and is producing more than 5 lb of mercury per ton. An open cut is now being made in the ore deposit, where even higher values are being recovered. Mine is situated 65 miles southwest of Battle Mountain.

Fritz McGonigle, and associates, all of Boulder City, are producing barite from a deposit on the northwest slope of Heminway Wash very near the Clark County city. The site is presently on U. S. Park Service land but will be in the proposed Boulder City limits. The deposit was originally discovered in 1945 but the area at that time was not open to mining. Relaxed regulations permitted operations to begin, and ore is now being produced and shipped.

Now You Can Recover Your Fines With This...



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Thousands of tons of valuable sand in the minus 50 mesh range are lost with wash water in Sand Plants all over the world. The well-known Cottrell Whirlcone Separator will save this sand at small cost.

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The Whirlcone will de-slime and dewater these fines with approximately 95% efficiency in the plus 200 mesh range. There is a GIW Slurry Pump and a Cottrell Whirlcone Separator combination to fit any plant flow sheet. If you are losing fines, let us have your inquiry giving approximately the volume of flow and the nature of the losses. Our recommendations and literature will follow.

NEW MEXICO

Sabre Uranium Corp. disclosed in its first annual report it has opened negotiations with the AEC for permission to build a mill to treat ore from its properties in the Grants area. Mill would have a capacity of 500 to 1,000 tpd, the report said.

Sabre has reelected to its board of directors Hugh M. Craigie and Charles M. Green Jr., both of Grand Junction, Colo.; W. R. Montgomery, Robert F. Thompson, Jack C. Vaughn and Hugh Bradford, all of Dallas, Texas. New directors are C. M. Warren of Albuquerque and R. M. Crichton of Nashville, Tenn.

Sabre's multi-million dollar uranium discovery near Grants has been termed one of the largest of the year.

New Jersey Zinc Co. reopened the Hanover mine in September, with shipments going to the company's Depue, Ill., smelter for production of zinc metal. Mine had been maintained at standby for the past two years; is now nearing full capacity.

During shutdown, company engineers modernized the installation, including erection of a new headframe and the beginnings of a new shaft. New surface structures, including a hoist house, are also planned or already under construction.

NORTH CAROLINA

Floyd Hayes of Elk Park has been elected president of the newly-organized Appalachian Uranium Association, composed of prospectors and miners in North Carolina and Tennessee who are seeking to get the Federal Government interested in the uranium potentials of the Tennessee-North Carolina Blue Ridge and Great Smoky Mountains.

Other officers of the group, elected at a meeting at Elizabethton, Tenn., October 8, are: Ivan Hodge of Elizabethton, vice president for Tennessee; Mrs. Lelia Hillard of Vilas, N. C., vice president for North Carolina; J. T. Leath, Elizabethton, secretary; Jack Bretler, Mountain City, Tenn., and Paul Shackley, West Jefferson, N. C., assistant secretaries. Steve Lacy, Johnson City, Tenn., miner, was named counselor for the group.

GM DIESEL
CASE HISTORY No. 556-188

OWNER: Badgett Mine Stripping Corporation, Madisonville, Ky.

INSTALLATION: GM "6-110" Diesel-powered Bucyrus-Erie 3-yard shovel loading fleet of GM Diesel-powered Euclid rear dumps on Pennsylvania Turnpike extension project.

PERFORMANCE: Partner Brown Badgett says GM Diesels are "doing a wonderful job." He's running his shovel 10 hours a day, plans to start 24-hour operation soon.

"Doing a Wonderful Job"

FEW WOULD expect to find a mine-stripping contractor on a road-building job. However, where there's dirt and rock to be moved in a hurry it is *not* unusual to find a General Motors Diesel-powered excavator. The faster, livelier crowd and swing of a "Jimmy" powered shovel means more yards per day at a lower cost per yard.

Principal reason for this snappy action is that a GM 2-cycle Diesel delivers power on *every* piston downstroke—not on every *other* downstroke as in 4-cycle engines. That means faster acceleration, instant response to throttle demands, real "go" when the bucket takes a bite.

And a GM Diesel costs less to maintain, too. Valves cost up to 62% less, cylinder liners cost up to 40% less, than similar parts for other Diesels.

More than 150 different manufacturers pick GM Diesel power for over 850 different models of equipment they build. Your GM Diesel distributor can give you the list plus full information on GM Diesel engines. See him today or write direct.

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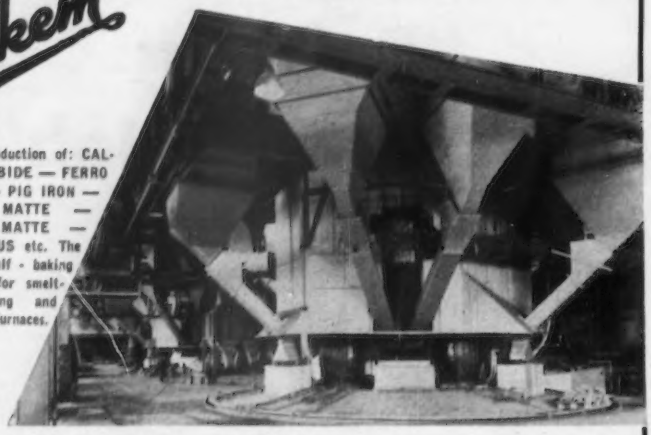
For the production of: CALCIUM CARBIDE — FERRO ALLOYS — PIG IRON — COPPER MATTE — NICKEL MATTE — PHOSPHORUS etc. The Soderberg self - baking Electrodes for smelting, melting and aluminum furnaces.



Furnace Platform of three 33,000 KVA Elkem Pig Iron Furnaces (Type Tysland—Hole) at Mo i Rana, Norway

In existence for over 50 years, Elektrokemisk has served as consultants and constructors of smelting plants and aluminum reduction cells.

Leaders in metallurgical plant design and erection, Elektrokemisk has introduced Soderberg safe self-baking electrodes and furnace construction in over 30 countries all over the globe.

Consult Elektrokemisk's New York Office regarding your furnace construction problems.

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Flexipipe is now available with Rope Seam Suspension *at no additional cost.* The newest, best, quickest suspension . . . eliminates special accessories and suspension wires . . . *all you need is a nail.* It equalizes strain on the tubing.

Flexipipe is efficient, serviceable, economical. Nyprene, jute and heavy-duty grades available in a variety of lengths and diameters to meet your requirements.

Write for complete information and sample.

OREGON

DMEA loan for 4,000 ft of churn drilling has been approved for exploration work at the Bretz Mercury mine, leased by U. S. Mercury Corp., which recently traded all its assets of cash and mercury properties for stock in Shewano Development Corp., New York.

Drilling to date, which is reportedly covered by the DMEA loan, has revealed existence of a substantial orebody. Mine is just over the Nevada border line.

SOUTH DAKOTA

Midwest Lithium Corp., Rapid City, has announced a lithium processing plant in the Black Hills may be ready for operation by the first of the year.

Firm will mine ore between Hill City and Custer and process it at the old U. S. Gypsum Co. plant near Piedmont. Ore presently is being shipped for processing in Minnesota and New Jersey.

Plans call for remodeling at a cost of about $100,000 and installing new machinery. Other ore producers in the area will be able to use the facilities.

AEC has informed claim holders in northwestern South Dakota that uranium-bearing lignite will not be stockpiled. Sen. Francis Case and Rep. E. Y. Berry quoted AEC as saying the uraniferous lignite found in the region creates a stockpiling problem because excessive dust losses occur when the material weathers and deteriorates while exposed to air.

WASHINGTON

High grade shipping ore running about 2% has been discovered at Dahl Uranium Mines, Inc., in Mount Spokane area, according to company's vice-president, H. J. Tibbits.

Property is 1¼-miles northwest of Daybreak Uranium holdings. Tibbits said the 21-in. vein dips into a north slope on the property. He said radiometric assays of the ore indicated its high grade content.

William D. Weaver, company consulting geologist, has been appointed general superintendent. Company is negotiating for a contract with AEC.

Daybreak Uranium, Inc., began work in mid-September on a new contract to furnish 1,000 tons of ore from company mine north of Spokane to the AEC. Ten carloads of ore were shipped shortly after mid-September from stockpiles.

Northwest Mining Association hopes it has won the right for miners to extract minerals from beneath Washington national forest lands, to be withdrawn from claim staking. The right was provided in an amendment to proposed withdrawal order approved Sept. 12 by association officials and submitted to forest service attorneys.

Amendment was presented to forest service and Bureau and Land Manage-

Turbo-Topics

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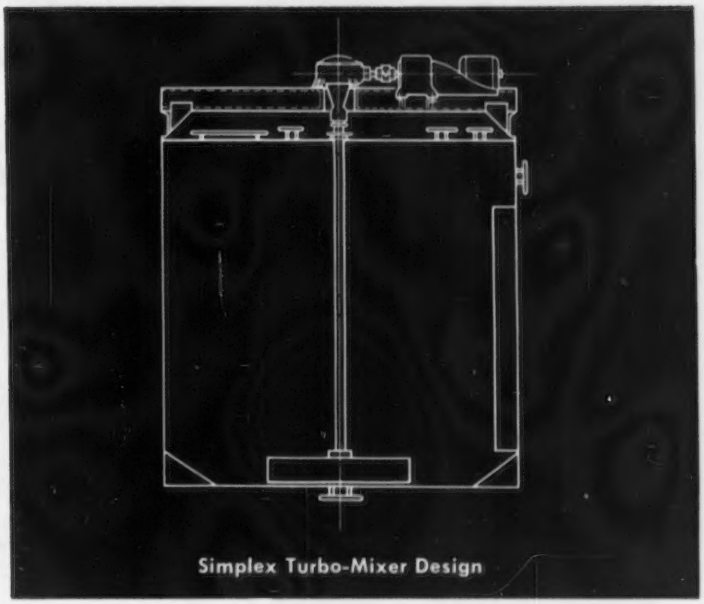
from laboratory to pilot plant to production, you can rely on TURBO-MIXERS



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Leaching titanium sponge is no easy job—not for ordinary mixers. Competitive mixers tried in pilot tests were unsatisfactory. Turbo engineers were called in—and following tests at our laboratory, a workable design was created. The design was verified with a Turbo-Mixer in the customer's pilot plant. Then, the customer asked if we could set up a full scale unit at our shop and test it under actual plant conditions with a full charge of titanium sponge. We could! We did!

Seven large Turbo-Mixers are being installed to leach titanium sponge for another satisfied Turbo customer. A Turbo engineer is available to work with your men in solving difficult engineering problems. Use his services . . . there's no obligation. **It pays to plan with General American.**

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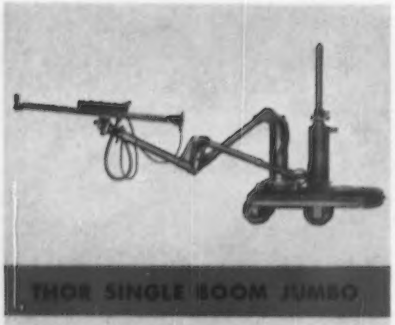
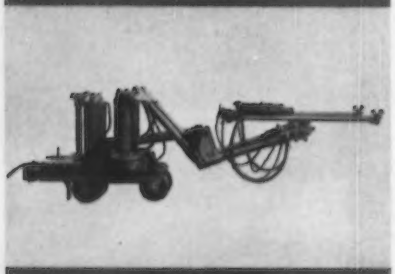
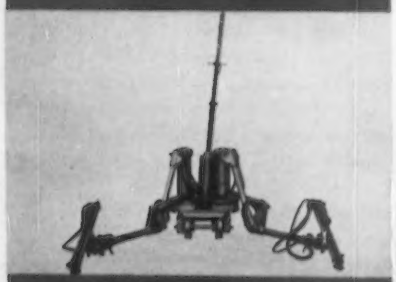


THOR SINGLE BOOM JUMBO



THOR DOUBLE BOOM JUMBO



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EASIER OVERHEAD DRILLING

- ✓ **COMPLETELY OPERATED BY AIR**—No hydraulics.
- ✓ **EASIEST TO SET UP**—Elimination of many time-consuming operations such as blocking, use of extension rods and constant adjustment of the jack provides faster, easier set-ups.
- ✓ **EASIEST TO OPERATE**—Horizontal swing of the boom is automatically locked by air pressure . . . and may be controlled by the operator without leaving his drilling position.
- ✓ **DRILLS ROUNDS FASTER**—When air pressure is released from the boom column . . . very little effort is required to swing the boom to a new position. Apply the air pressure and drill a new hole.
- ✓ **QUICK STEEL CHANGES**—New Thor Power Feed Drifter Mountings, with rapid advance, rapid return and full power feeding at all speeds assure fast efficient drilling, faster steel changes, fewer stuck steels, and reduces total man-hours of labor per hole drilled.
- ✓ **LOW MAINTENANCE COSTS**—Hollow boom carries all supply and control pipes, protecting them from injury. Air motor may be removed without disturbing the boom. Boom actuating screw is hermetically sealed to prevent the loss of lubricant and avoid abrasive damage by foreign matter.

New Thor Jumbo easily disassembles to 3 parts facilitating handling in mine cages.

Illustrated is Two-Boom style . . . One-Boom and Special Models available, details on request.

SPECIFICATIONS

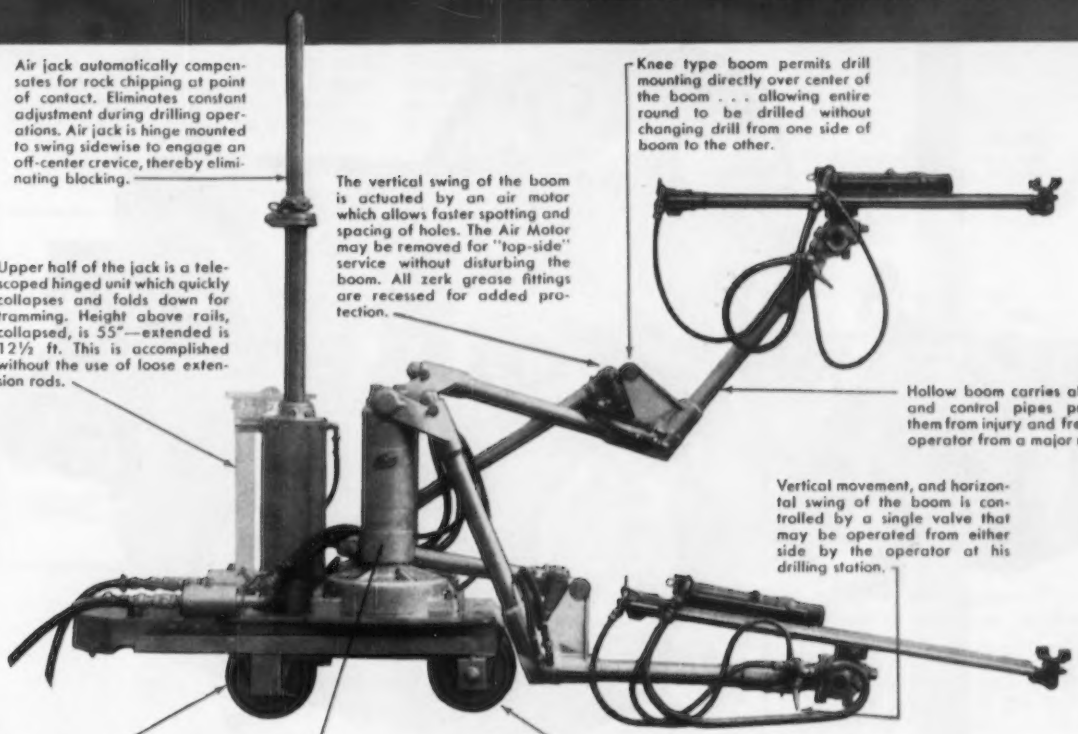
	1 Boom DB-100	2 Boom DB-200
Size of Chassis	18" x 35" x 80"	18" x 35" x 80"
Wheel Base	36"	36"
Track Gauges	18"	18"
Size Heading Recommended	8' Wide x 10' High	12' Wide x 10' High
Weight Bare	3600 lbs.	6000 lbs.
Crated For Domestic	3700 lbs.	6100 lbs.
Boxed For Export	4000 lbs.	6400 lbs.
Air Lines	1" Hose	1" Hose (Double)
Water Line	½" Hose	½" Hose (Double)
Boom Column Complete: Bare	1530 lbs.	
Crated For Domestic	1650 lbs.	
Boxed For Export	1750 lbs.	

BOOM ARMS AVAILABLE AS INDIVIDUAL UNITS

Individual Boom Arms—suitable for truck or tractor mounting, or for job-site multiple mounting—are available as single units. Boom Arms can be furnished in Offset Type or Center-Head Type.

JUMBO

DESIGNED BY THOR ENGINEERS IN CLOSE COLLABORATION WITH ENGINEERS OF THE MINING INDUSTRY



Air jack automatically compensates for rock chipping at point of contact. Eliminates constant adjustment during drilling operations. Air jack is hinge mounted to swing sidewise to engage an off-center crevice, thereby eliminating blocking.

Knee type boom permits drill mounting directly over center of the boom . . . allowing entire round to be drilled without changing drill from one side of boom to the other.

The vertical swing of the boom is actuated by an air motor which allows faster spotting and spacing of holes. The Air Motor may be removed for "top-side" service without disturbing the boom. All zerk grease fittings are recessed for added protection.

Upper half of the jack is a telescoped hinged unit which quickly collapses and folds down for tramming. Height above rails, collapsed, is 55"—extended is 12½ ft. This is accomplished without the use of loose extension rods.

Hollow boom carries all supply and control pipes protecting them from injury and freeing the operator from a major nuisance.

Vertical movement, and horizontal swing of the boom is controlled by a single valve that may be operated from either side by the operator at his drilling station.

Rear wheels are spring mounted allowing car body to set on the track when the air jack exerts pressure on the ceiling or back . . . This feature makes the car a rigid platform for the operation of the drill—eliminates time consuming clamping and blocking operations.

Boom column air piston under pressure automatically locks the horizontal swing of the boom preventing boom drift and binding during drilling operations. When air pressure is exhausted boom will swing with very little effort.

Large 14" wheels mounted on Timken Bearings for easy rolling. Wheel treads are 3½" wide to compensate for variable gauge track. Practically eliminates de-railing difficulties.

FIELD-TESTED FOR 3 YEARS

THIS new Thor engineered Jumbo with simplified operating controls, is packed full of new design features . . . features that will speed your drilling operations. You can set up . . . drill a round . . . and remove this Thor Jumbo from the face in less time and with less effort than any other similar machine on the market today. Write for additional information on how this new Thor Jumbo will speed your mining operations . . . or, if you request we will send a Thor Mining Engineer to give you personal on-the-job assistance. Write Thor Power Tool Company, Aurora, Illinois.

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NEW Mack B-80 SERIES—

a money-making giant for mining

New features make this rugged six-wheeler more powerful, sturdier . . . and a greater work producer than even its great Mack predecessors!

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Washington *(Continued)*

ment officials as the result of an NMA protest last October to the withdrawal plan. Plan called for withdrawing more than 31,000 acres from entry under public laws, most of the area to be along scenic highways in Snoqualmie and Gifford Pinchot national parks. Public camp grounds were involved in Pinchot, Chelan, Mount Baker, Olympia and Wenatchee national forests.

E. C. Stephens, chairman of the association's public lands committee, gave the wording of the amendment proposal: "This withdrawal shall not prohibit the underground exploration, development and mining of ore deposits discovered on any valid lode mining claim outside of and extending into the withdrawn area, so long as such exploration, development and mining will not disturb the surface values for which the withdrawal was proposed."

Lexington Silver-Lead Mines, Inc., has acquired an interest in stock of Kit Carson Uranium, Inc., and Moonlight Uranium, Inc., two recently-organized firms with claims in the Mount Spokane area. Surface stripping and moderate trenching indicated presence of high-grade autunite in several places on Kit Carson ground. Promising surface radioactivity has been reported on the Moonlight property.

Spokane County Engineer Clyde J. Chaffins complained that eager-beaver uranium prospectors have been hacking holes in county roads, blasting roadside claims and leaving the rock debris in the road. Chaffins said his crews cleaned more than a dozen rock piles in one week alone in the Mount Spokane area.

Chaffins explained that miners may stake claims over county roads but, under law, should not bother the surface of the roadway. "Prospectors have hacked out holes in the middle of some roads," the engineer declared, "and if the ground didn't check out, they just left the hole and moved on."

If the prospectors are caught? They'll have to clean up the roadway and pay for repairing it. So far no one has been caught.

Reeves MacDonald Mines, Ltd., a subsidiary of Pend Oreille Mines & Metals Co., is planning resumption of its Nelway property after a closure of two years, W. L. Ziegler, general manager, announced. Increased zinc price and ability to dispose of concentrates to markets in U. S. are given as reasons. Sullivan mine at Kimberley was only British Columbia mine milling a larger tonnage of lead-zinc ore before Reeves MacDonald shut down. From 1951 to the time of the closure, mill averaged from 25,000 tons per month to 30,000 tons.

Goldfield Consolidated's Deep Creek mine east of Northport was shut down in September due to fire. Company's Sahara zinc mill, 10 miles south, was also shut down by the fire. Six miners who were working at the 750-ft level when the fire broke out at about the 250-ft level escaped by an emergency exit. Cause of the blaze was believed to be a short circuit in electric cables connected to mine's water pump.

Willis Swan, vice-president and general manager, of Reno, Nev., inspected the mine with Trueman Higgenbotham, manager, and reported repair work would start immediately. He said the mine would be in operation within 3 or 4 weeks.

UTAH

Utah Mining Assn. has gone on record for extension of the domestic purchasing program on uranium through 1966. The group, in amendment of its policy statement of last year, said that in view of fact certain foreign uranium firms have contracts with AEC to that date, the commission should grant domestic miners a like deal.

Policy statement stressed that there were social and economic problems outside the uranium industry itself which must be considered in light of the commission's domestic buying program. Among these are service industries to mining, expansions of school and community facilities by towns and cities in the uranium belt; state and local taxation; and the general public itself.

Statement also will serve to guide the

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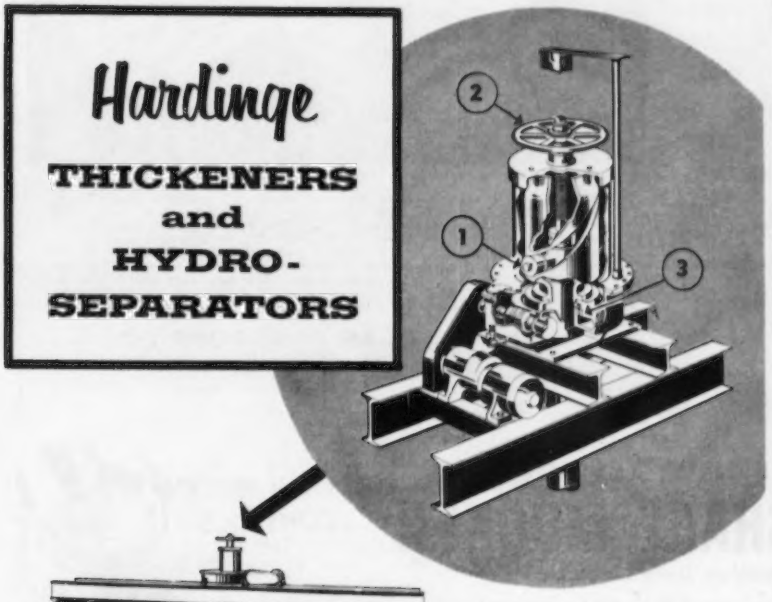
THICKENERS and HYDRO-SEPARATORS



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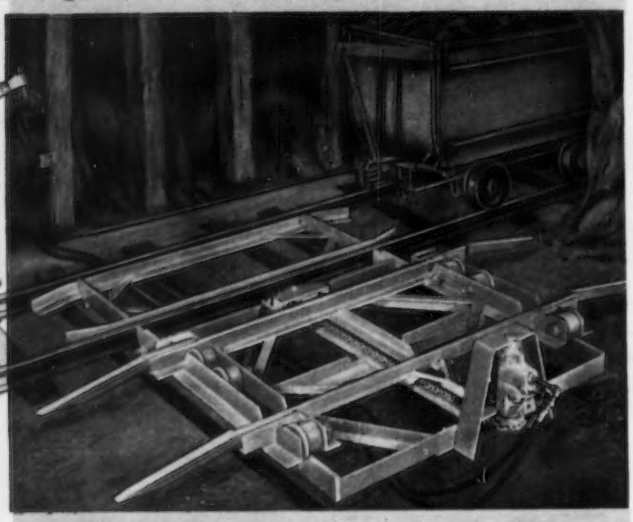

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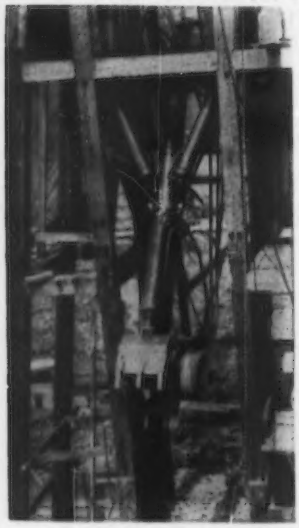

The Cryderman shaft mucker has eliminated the hard work of shaft mucking. With air powered controlled bucket and telescopic boom reaching out in any direction, the operator is in full control of the mucking operation at all times.

Like a human arm the telescopic boom with its air powered clam bucket goes into the muck pile with force. After picking up its load the "human arm" action places the muck in the bucket without loss of motion.

A big time saver with the Cryderman shaft mucker is the fact that it can be quickly lowered to the shaft bottom for mucking without chaining or anchoring to the shaft timber. This means it hangs free on the guides. When mucking is finished, it is quickly hoisted to surface or to an intermediate level for any necessary servicing. It can be moved up or down the shaft as easily as a shaft bucket.

From the safety of his cage compartment and in full view of the entire shaft, one man operates the Cryderman mucker. This gives him a big advantage in that he can place the clam bucket at any desired spot in the shaft.

Another advantage is its ability to work well in shafts where weak walls demand that timber be carried close to the shaft bottom.

The Cryderman mucker has a big advantage in rough muck. Its ability to pull large boulders out of the muck and place them into the bucket is without parallel in shaft mucking

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Utah (*Continued*)

Utah delegation at western governors mineral conference in Sacramento, Calif. Nov. 6-8.

Sale of 160 claims in the Cottonwood Wash area of San Juan County for an end price of more than $5-million was announced in August. Purchaser was Jay Bettles of Wallace, Idaho. Claims originally were located by Seth and A. Shumway of Blanding, who had turned them over to the Ransom Brothers Mining Co. of New Mexico to work on an option basis.

Bettles has turned the properties over to Uranium Discovery and Development Co. and Uranium Prince Mining Co., both of Wallace, for development.

Delhi-Taylor Oil Corp. is nearing completion on two potash holes being drilled to extend proved reserves at Seven Mile. One well is down 4,000 ft and the second 3300 ft. Potash beds are between 3,000 and 4,000-ft deep in the area nine miles northwest of Moab, Grand County.

Western National Co. Ltd., announced Sept. 29 it has purchased a location near Monticello to erect a metallurgical laboratory to treat all metallic elements. Work is to begin sometime in early 1956.

Western National owns 17 uranium claims in the Big Indian Wash now being drilled, and 200 claims 20 miles northwest of Blanding. Orebody of about 100,000 tons has been blocked out in partial drilling of the latter group, Grover Moore, chief consulting geologist, said.

Utaco Uranium, Inc., of Moab has obtained an operating lease on 13 Red Canyon claims owned by Mohler Brothers Enterprises and Jack Turner. Partial drilling of one claim has blocked out a 10,000-ton orebody, the owners said.

Utaco also has obtained an option on 104 claims in the east Lisbon Valley, and expected to start mining that property in October.

Temple Mountain Uranium Co. is in the lead-mining business with increasing profit. The firm, organized by old-timers in non-ferrous metals in the area, reports shipments of 30 tons of lead concentrates weekly from mine at Mona to Midvale smelter of United States Smelting Refining & Mining Co.

Small jig mill recovers only lead values from the mines. But concentrates have won a net smelter settlement of $140 a ton at Midvale and operators figure to make a $70 a ton profit from shipments even though mine has had to go on two-shift basis.

Firm also is shipping uranium ore from its Stocks-Gramlich lease in southeastern Utah.

Shortage of water in the area is seriously affecting the future construction program of the Atomic Energy Commission's Monticello mill.

Commission has a multi-million dollar expansion programmed, in addition to the $2-million project now being completed.

Expansion of the sampler has been delayed until next year, residents report. There are differences of opinion between Monticello city government and the Commission regarding construction of reservoirs in the mountains to serve the mill.

Office of Defense Mobilization has granted Uranium Reduction Co. a $10-million rapid amortization certificate for tax write-off of 80% over five year period on the firm's uranium mill under construction at Moab.

Hecla Mining Co. was expected to commence shipment of ore in October from the Radon claims, Big Indian District, where firm has a management contract with Federal Uranium Corp. Hecla has a contract with AEC for delivery of at least 4,000 tons of uranium ore monthly to the Moab sampler operated by AS&R for the commission.

Meanwhile, company has completed its three compartment shaft and in doing so, has hit a previously undetected high grade body of ore. Shaft was located so as not to bisect orebodies delineated by drilling. However, a sheet of ore averaging 1% or more uranium oxide 3- to 4-ft thick has been cut.

Ore elsewhere in Radon property runs on average of 0.7% U_3O_8.

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Carbide Rok-Bits—cross or chisel types—gauge sizes: 1¼" thru 4½"

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Utah *(Continued)*

McFarland & Hullinger, Tooele, Utah, mine contractors and mining specialists, have signed an agreement with Homestead Mining Co. on exploitation of the latter firm's uranium-vanadium holdings in Rattlesnake near La Sal, San Juan County.

Under terms of the agreement, McFarland & Hullinger will explore, develop mine and ship ore from 12 claims, granting Homestead 25% of gross mill receipts. Contractors will bear all expenses.

Properties, near the Continental Uranium Co. open pit, will be mined underground, although ore is only at 52-ft level. McFarland & Hullinger are now operating Maybe Mine in Red Canyon, White Canyon District, San Juan County. Production from this mine is scheduled to be stepped up.

WYOMING

Loma Uranium Co. said its first 65-ton shipment of ore from its properties on Box Creek, 25 miles northwest of Douglas, assayed 0.42% uranium oxide. Production is averaging 25 tpd, the company said, and orebody is believed to be one of the largest yet discovered in the Powder River Basin.

A $750,000 contract has been let by Great Western Aggregate, Inc., for the conversion of part of its alumina plant at Laramie to the production of light weight aggregate. Robert F. Blanks, vice president and general manager, said contract for engineering and construction went to Stearns-Roger Co., Denver, Colo.

Blanks said engineering work has already begun and construction should start within six weeks and be completed just after the first of the year. "We completed our pilot plant testing and have decided to obtain the raw material from Benton Shale, about 6 miles south of Laramie," Banks said.

Discovery of a commercial grade selenium deposit has been announced by St. Michael's College Foundation, Inc., of Santa Fe, N.M., and Shawano Development Corp. of New York. Deposit was discovered on one of 17 uranium claims owned by the two firms in Poison Basin area west of Baggs, Wyo., near Colorado border in south central Wyoming.

Mineral consultant O. A. Beath, head of Wyoming University chemistry department, said a Bureau of Mines official told him the Government would take 1-million lb of selenium for use in electronics equipment. "There has been no previous mining of selenium, so there is no estimate as to what the deposit might eventually be worth," Beath said. "But since the demand is so great, I doubt that price would be considered in Government purchases."

He said boring tests made at the site showed a content of up to 0.69% and preliminary core tests indicated high reserves of the vital material. Beath said the deposit has "wonderful commercial possibilities."

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START a smelting furnace to work and there's no shutting down for making replacements. Every piece of equipment has to stay on the job until you make a complete shut-down. This is especially tough on electrode holders, since they're located where temperatures are highest and corrosive conditions worst.

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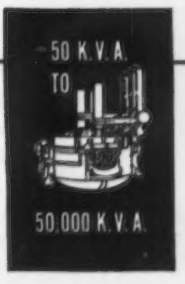

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in all types of mine cars
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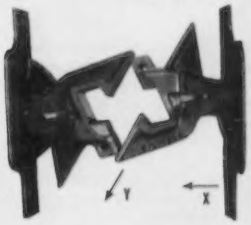
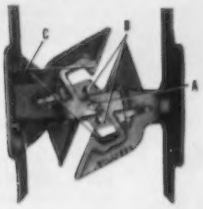
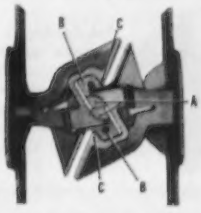


2. Pressure of one coupler against the opposite coupler forces the two into correct coupling position as train movement (X) aligns couplers (Y).



3. Locks (A), pushing against each other, retract into coupler head and permit lugs (B) to slide along coupler face into interlocking jaws (C).



4. Locks (A), having cleared each other, return to locked position without pre-setting or manual assistance; lugs (B) are now held interlocked with jaws (C).

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The diaphragm pump with the

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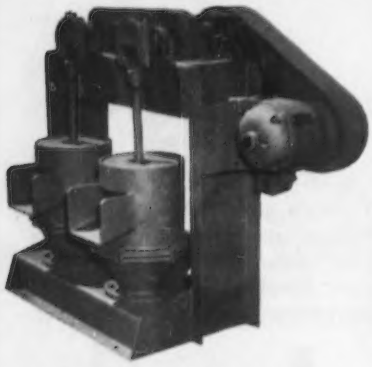

It can be opened, all wearing parts replaced, and the pump reassembled in a total of less than 10 minutes. Simplicity makes the Wemco Diaphragm Pump an operator's first choice among pumps for controlling and metering the underflow of thickeners, clarifiers and hydroseparators. It can serve anywhere for accurately measured pumping of thick solids at low head.

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Wyoming *(Continued)*

Further exploration of the vast trona beds west of Green River is being carried on by Intermountain Chemical Co. Core rig is drilling six miles west of town and east of Blacksfork River to determine extent of the trona beds.

Sale of two promising lithium and rare earth properties in Fremont and Natrona Counties to Kenneth J. de los Rios, Los Angeles mining engineer, has been disclosed by the *Wyoming State Journal* in Lander, Wyo. Sale price was not reported, but the newspaper said a substantial sum was involved.

De los Rios is said to be planning construction of a mill on each of two groups of properties involved. Transaction included the Whippet 1 through 9 claims on Bridger Mountain in the Owl Creek Mountains, and the Marvel 1 through 7 claims in Black Mountain in Natrona County.

IN CANADA

ONTARIO

Uranium deposits discovered in the Blind River area "apparently are larger than in the Belgian Congo or any place else in the world," a Canadian told the 25th annual meeting of the Society of Exploration Geophysicists, Oct. 6.

David S. Robertson of Blind River said ore already is being mined and milled but "additional reserves are being found every day."

Robertson said proven tonnages exceed 50-million in the immediate vicinity of Blind River. Current exploration indicates tonnages "well over the 300-million mark," he added.

Maybrun Mines is starting shaft work on its copper prospect in the Atikwa Lake area near Kenora, Northwestern Ont. Initial objective is 300 ft for the three-compartment opening. Surface drilling has indicated 790,000 tons to the 300-ft horizon averaging 1.56% copper.

To furnish acid for the uranium mines of Blind River, Noranda Mines has started construction of a sulphuric acid plant at Cutler that will rate as Canada's largest. Capacity will be 500 tpd. The location is some 25 miles east of the village of Blind River. Raw material will be pyrite from the Noranda mine in northwestern Quebec.

Can-Met Explorations Ltd., deep drilling its ground adjacent to Algom Uranium's Quirk Lake mine in Blind River, is negotiating with Ottawa for a sales contract for uranium oxide concentrates. Management estimates indicated reserves at 5-million tons averaging 0.10% U_3O_8, with possibility of expansion to a tonnage considerably larger. Ore indicated is considered adequate for construction of a 2,000-ton mill.

Consolidated Denison Mines has started sinking its No. 2 (production) shaft. One of the biggest in Canada, 16 x 28 ft, it will go down to 2600 ft, cutting the ore horizon at 2400 ft. Plans also are being started for mill construction, the plant to have a capacity of 5,700 tpd, believed to be the world's largest mill devoted solely to uranium output. Start of production is scheduled for July 1, 1957. Ore reserves are now computed at upwards of 25-million tons averaging better than 0.11% U_3O_8.

In Southeastern Ontario's Bancroft area, Dyno Mines has changed its development plans to accelerate progress toward contract negotiation, following Ottawa's announcement that no special contracts will be negotiated after March 1956. Instead of sinking to 500 ft as originally planned, the shaft will be stopped at 200 ft to permit lateral work to be done on the first level at 180 ft. A total of 2,000 ft of lateral work, 300 ft of raising, and extensive bulk sampling will be done on this level before shaft sinking is resumed. Indicated ore is reported at 1.3-million tons averaging 0.085% U_3O_8.

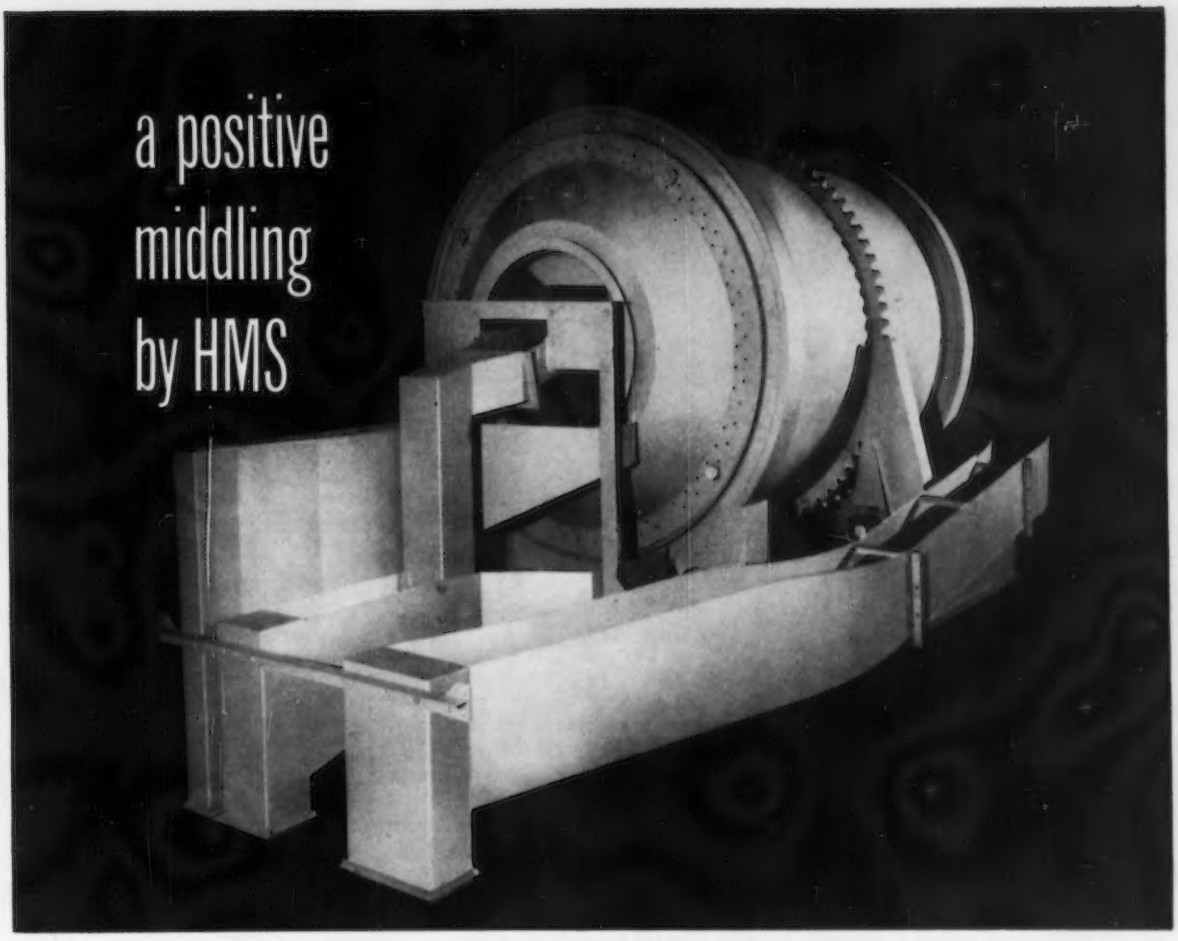
Two active Bancroft area uranium prospects have merged their adjoining properties into one operation, the two being Blue Rock Cerium Mines and Rare Earth Mining Corp. Both companies have done extensive surface work and diamond drilling, and report the probable ore indicated in several zones as close to 2-million tons averaging close to 0.11% U_3O_8, plus possible values in thorium, rare earths and other minerals. Each company has started underground work, Rare Earth having about finished its shaft to 500 ft, while Blue Rock has just started one. It is likely that a main production shaft, to serve all zones, will do down midway between the two.

McIntyre Porcupine Mines, veteran gold producer of the Porcupine area, has started work on the big internal shaft that has been planned to serve the mine's deep levels. To cost $1.5-million and take two years to sink, the new shaft will extend from the 3875-ft level to the lowest level at 7,000 ft.

QUEBEC

Campbell Chibougamau Mines newest copper producer of the Chibougamau area, is achieving excellent results in its first year of milling. The concentrator, nominally rated as having a 1,750-ton capacity, has had no difficulty in handling up to 2,000 tons. Concentrates shipped to the end of August contained 8.5-million lb of copper and 13,485 oz gold. Plans are now being made to deepen the shaft from 1,275 to 2,250 ft, to permit establishment of six additional levels.

Rainville Mines, with ground east of Golden Manitou in the Val d'Or area, has arranged for construction of a 300-ton mill, with next April set as tentative starting date for production. Rainville's main ore source is its No. 4 zone, where 352,000 tons has been developed with average grade 2.32% copper; while the No. 2



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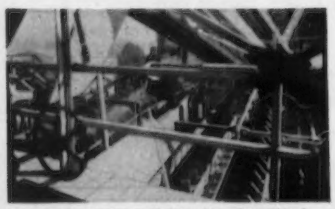
Two pairs of 30' McLanahan Logs, used for cleaning sand and gravel in Virginia.

McLanahan Paddle Mill and Log Washer cleaning Texas limestone.



New and old type McLanahan Log Washers used here remove clay from cement rock in Pennsylvania.

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Quebec *(Continued)*

zone, opened extensively during the past few months, is expected to produce a substantial tonnage too, though of slightly lower grade.

In spite of several delays caused by difficulties in obtaining and installing equipment for the seven-mile conveyor system and for the enlarged Waite Amulet mill, West Macdonald Mines has reached the production stage. At present, better than 700 tons of ore is being mined and shipped, and it is expected that the projected 1,000-ton rate will be achieved well before year-end. Company is controlled by Noranda Mines, with Macdonald Mines holding vendor interest, and its zinc-pyrite ore is being treated by Waite Amulet on a custom basis.

New shaft is being sunk by Ascot Metals Corp., zinc-lead producer, near Sherbrooke in the Eastern Townships. Designed for a depth of 400 ft, the shaft will tap the ore in the Silver Star and Howard zones.

Processing of feldspar will begin late this year at the property of Spar-Mica Corp. at Johann Beetz near the south shore of the St. Lawrence River. Plans call for production capacity of 300 tons of spar concentrate daily, and expectations are that 100,000 tons will be shipped in 1956. Mining and milling plants are being installed at the property, and a loading dock at the river. Finished product will be shipped to Camden, N. J., where it will be stockpiled for sale.

Oceanic Iron Ore of Canada Ltd., with property on the Morgan Lake Range west of Ungava Bay in northern Quebec, reports that drilling during the past season has indicated 250-million tons of concentrating iron ore averaging 25-30% iron, with evidence that further work will increase the tonnage substantially. Studies are now being instituted on production costs and possible markets.

NEWFOUNDLAND

Dominion Wabana Ore Ltd. is now geared for iron ore shipments in excess of 3-million tons annually, following installation of a heavy-media separation plant and an 8800-ft conveyor system which carries the ore to the company's shipping dock.

The company's three mines, located at Bell Island in Conception Bay on the east coast of Newfoundland, are now equipped for the mining of 14,000 tpd ore, and it is expected that they will be operating on that basis within the coming year, compared with the present rate of 12,000 tons. As mining is carried on throughout the year, such a rate will make it possible to ship more than 3-million tons during the nine-month shipping season. About half of the product goes to the furnaces of Dominion Steel & Coal Corp., the parent company, at Sydney, N. S., while the remainder is sold in the United Kingdom and Germany.

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British Columbia's Phoenix District Shows New Life in a Vigorous Copper Atmosphere

THE ONCE FABULOUS copper producing area of Phoenix, in British Columbia's border country, may live up to its Greek mythological name and arise from its own ashes.

Granby Consolidated Mining, Smelting and Power Co. is negotiating to buy back the property it sold in 1937 for $20,000 to Mayor W. E. McArthur of Greenwood, when copper was worth 7¢ a pound.

Neither party would say how much Granby (recognized as the best low-grade copper property operators in Canada) is paying for the mine it once walked out of.

Encouraged by the world-wide shortage of copper, and today's high price for the metal, the big mining company is sending crews to reopen the old "ghost" workings. Reports say there are 2- to 3-million tons of low-grade ore in the Phoenix area.

Four or five other companies, including Consolidated Mining and Smelting of Trail, B. C., are also searching once abandoned mines in the area, seeking the now valuable ore.

Granby president L. T. Postle confirmed, "We are negotiating an agreement with Mr. McArthur to take over a portion of the old Phoenix camp."

He added the plan is to supplement Granby's Lone Star property just across the border in Washington State.

A six-man drilling crew was to visit the B. C. property. Postle said development work will be based on reports made by Dr. D. F. Kidd, president of Attwood Copper Mines Ltd., who had option to purchase the property from McArthur but dropped it about five years ago.

At the start of the war McArthur took out 44,000 tons ore, had it milled at Greenwood and shipped the concentrate to Tacoma. Unable to get miners during the war, he closed down the property.

In 1906 when production at Phoenix hit 800,000 tons, dividends amounted to $1,602,000.

Granby moved in with the rush of prospectors in the late 1890's and began clearing land for its big smelter at Grand Forks in 1899. Something like a million tons of ore a year went through the smelter. In 1905 there were 26 companies shipping ore.

But the boom phase came to an end when drifts both ways ran into waste.

Consolidated Mining and Smelting is reported to have picked up some claims at the old copper camp seven miles west of Greenwood.

The Mother Lode property, staked in 1891, was another major development in the area and fed a big smelter at Greenwood. Surety Oils and Minerals of Toronto is diamond drilling in a search for orebodies known to exist there.

BRITISH COLUMBIA

Copper Ridge Silver Zinc Mines Ltd. has obtained an option on what it termed "a promising copper prospect" of 60 claims totaling 3,000 acres near Lake Cowichan on Vancouver Island.

Directors say the ore zone is expressed near the crest of a ridge about 700 ft above the valley bottom, and surface samples on one exposure averaged more than 2% copper over 5-ft widths.

Main zone had been partially opened up by six trenches for a slope length of 175 ft and a vertical distance in excess of 100 ft.

At 35c a pound, the copper so far sampled would have a gross value of over $30 a ton.

International Oil and Metals Corp. of New York is planning a million-dollar development of Nimpkish iron mines on Vancouver Island, according to an announcement by Julius B. Haffner, following his election as International's president in October.

Company is currently completing preliminary details on the program to develop the iron mine, he stated.

Haffner is former president of the Lead Industries Association of the U. S. and a former director of AIME.

Noranda Mines Ltd. of Quebec, Canada's biggest copper producer, has undertaken extensive underground development at the old Yreka copper property near Port Alice on Vancouver Island.

Noranda bought it after optioning the property in 1951 from Allan C. Watt and Knut Akre, forming a public company called Yreka Mines Ltd.

A program of underground development was started this year. Work has been done on the road and a skyline erected from the 1100-ft level to the 1950 level.

To date, says the company, an 8-ft zone of copper ore was intersected about 360 to 405 ft from the portal. The present face is 5 ft beyond this zone in skarn.

Gabbro Copper Mines Ltd., on Vancouver Island, reports that Noranda Exploration Co. is starting diamond drilling at Gabbro-S property at the south end of Vancouver Island. This decision follows geological and geophysical surveys conducted over the past four months.

Drilling equipment is on the property and drilling of an initial 5,000 ft was slated to begin this month.

Noranda Exploration, the exploration subsidiary of Noranda Mines Ltd., completed an agreement earlier this year with Gabbro Copper giving it an option on a controlling interest in the company.

NEW BRUNSWICK

Monpre Uranium Exploration Ltd. is planning work on three base metal prospects acquired under option. They include

WIRE ROPE AT WORK — The Marigold Coal Mining Company, Jasper, Alabama, specializes in stripping operations. The scene above is typical of the daily work; it shows a dragline excavator stripping off some 30 ft of overburden. When the pay seam is reached, the coal is broken out and loaded into trucks by a 1¾-yd shovel.

Because of the heavy loads handled with every drag, the powerful excavator requires the staunchest wire ropes. Three sizes of Bethlehem Purple Strand, ranging in diameter from 1¾ to 2¼ in., are used on the big machine. In a service more rugged than most, these tough, strong ropes have consistently proved their ability to take punishment, and to answer every demand with plenty to spare.

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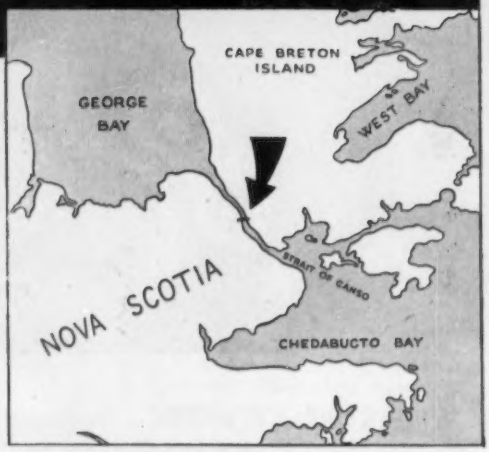
TEN MILLION TONS OF ROCK QUARRIED OUT OF MOUNTAIN TO BUILD CANADIAN CAUSEWAY

With the completion in only twenty-eight months of the three-quarters of a mile Canso Causeway, the Nova Scotia mainland and Cape Breton Island now have a new and vital link. Before its existence, all surface traffic over the Canso Straits went by ferry. Now, on a massive, dumped bed of rock quarried with the help of Atlas Copco rock drills, Sandvik Coromant Drill Steels and other equipment, a railroad track and highway have been laid, enabling trains, automobiles, and trucks to make their own way across the Canso Straits.



WORLD'S DEEPEST CAUSEWAY

Though the Canso Causeway is quite short in length, it has the distinction of being the world's deepest with a maximum depth of 210 ft. At this point, rock at the bottom of the bed had to be spread over 800 ft. Altogether, rock was required for a distance of 4,300 ft. across the Straits and for 2,700 ft. along the shore. In helping to block the great depth of the Canso Straits, Atlas Copco rock drills, Sandvik Coromant Drill Steels and other equipment, were used in one of the biggest rock-moving jobs ever undertaken in Canada.

98 TUNNELS DRILLED

By the time the Causeway had been completed, 10 million tons of rock were blasted for its construction out of the side of Porcupine Mountain on the mainland. To do this, the contractors, the Northern Construction Company and J. W. Stewart Limited, decided on the coyote-hole method of quarrying. This entails driving small tunnels, loading them

with dynamite and then blasting. On Porcupine Mountain, ninety-eight such tunnels were drilled, each 3.5 feet high, 5.5 feet wide and 5 feet deep.

ONLY 8 ROCK DRILLS AT WORK

The ninety-eight tunnels eventually involved 18,000 feet of tunnelling. For this work the contractors employed a very small drilling force consisting of only eight rock drills. Of these, seven were Atlas Copco light rock drills. They were fitted with Sandvik Coromant tungsten-carbide-tipped drill steels. All this equipment was supplied by Canadian Copco Limited.

SMOOTH QUARRYING PROGRESS

Even using the coyote-hole method, eight rock drills are not many when it comes to quarrying 10 million tons of rock. Yet these few rock drills were able to keep 180 men and a fleet of mechanical shovels and dumping trucks continually active clearing broken rock. Atlas Copco light rock drills fitted with Sandvik Coromant tungsten-carbide-tipped drill steels are a unique drilling combination. The obviously smooth way in which quarrying operations were carried out on Porcupine Mountain is typical of the results this drilling combination is bringing to construction projects all over the world.

Atlas Copco Compressed Air Equipment is manufactured or sold and serviced in 48 countries throughout the world by the *Atlas Copco Group*, which embraces companies trading under various names such as Atlas, Atlas Diesel, Atlas Polar, Atlas Copco, Copco, Delfos and Sampa.

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UNITED KINGDOM, The Atlas Diesel Co. Ltd., Wembley, Middx.; FRANCE, Atlas Polar S.A., 29, Rue Marbeuf, Paris 8e; HOLLAND, N.V. Holland-Atlas, P.O. Box 6056, Rotterdam; ITALY, S.A.M.P.A., Viale Marche 15, Milan.

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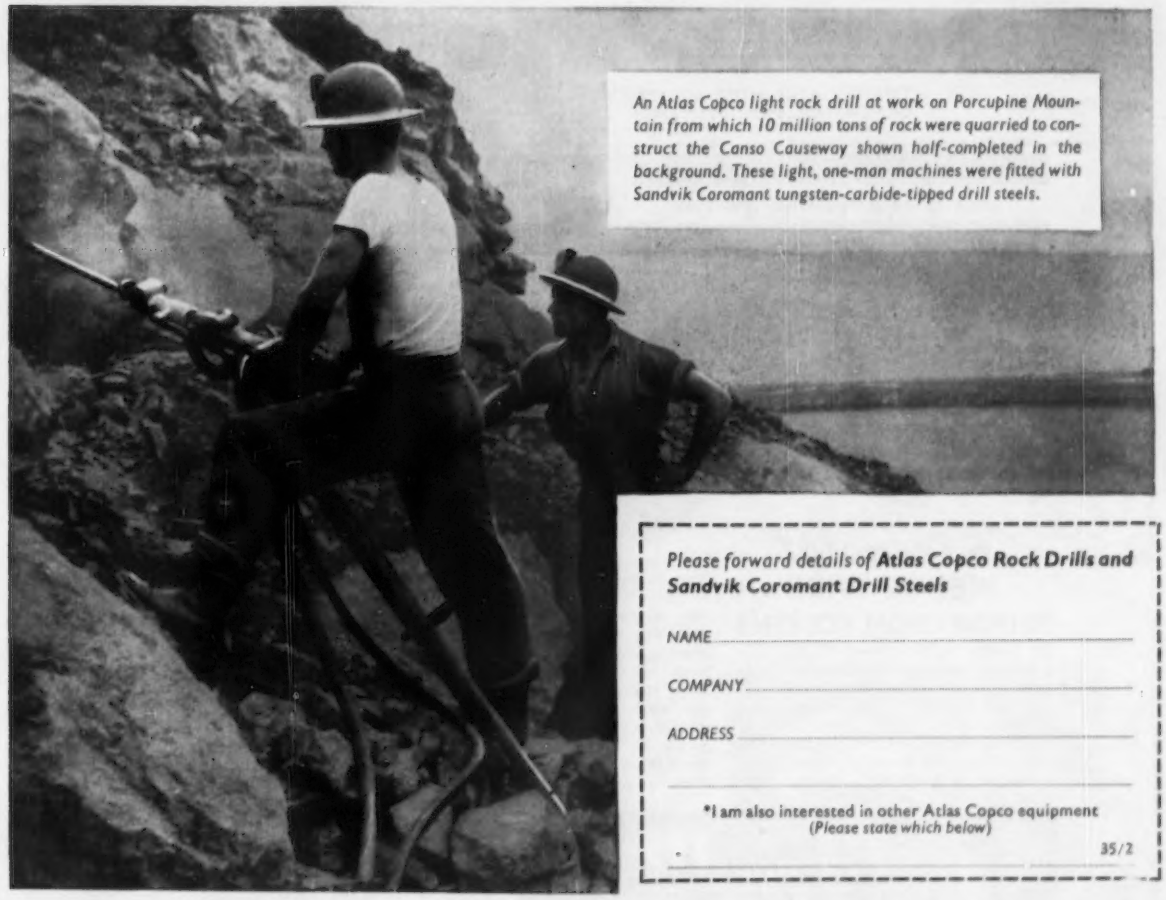
Readers in countries outside those listed above and who do not know the name of their local Atlas Copco company or agent, please write, in the first instance, to AB Atlas Diesel, Stockholm 1, Sweden.



An Atlas Copco light rock drill at work on Porcupine Mountain from which 10 million tons of rock were quarried to construct the Canso Causeway shown half-completed in the background. These light, one-man machines were fitted with Sandvik Coromant tungsten-carbide-tipped drill steels.

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New Brunswick *(Continued)*

40 claims about seven miles southwest of the village of Jacquet River; 20 claims in three groups in the Keymet area northwest of Bathurst; and two claims at McNair Brook 17 miles south of Charlo. Geological and geophysical work will be done on all groups, as well as general surface prospecting.

Diamond drilling is in progress on the property of Brunsman Mines in the Little River area southwest of the American Metals (Heath Steele Mines) property, following geophysical work which disclosed indications of potential merit.

Keymet Mines, the province's first lead-zinc producer, has started shipping concentrates to Antwerp, Belgium. Stockpiled at the mine and at the port of Bathurst for some months, the amount on hand was close to 4,000 tons when the first shipment was made in mid-September. It is expected that 4,500 tons will have been shipped by year-end.

MANITOBA

Eldorado Mining and Refining Ltd., government-owned uranium processing firm, will expand its milling facilities at Beaverlodge from the present rate of 700 tpd to 2,000 tpd. Target date for the expansion, to cost more than $12-million, is early 1957.

First rated capacity, using the then-new alkaline leach under pressure with high temperatures was 500 tpd in 1951. In 1954, capacity was upped to 700 by addition of an atmospheric pressure leaching circuit. Latter method will be used in the construction of new mill capacity, to cost some $6.5-million.

Violamac Mines are planning to sink a 1,000-ft production shaft on their Cat Lake lithium property. 4-million tons of ore grading 1.28% lithia is now indicated with drilling still continuing. Property is 6 miles from the Bird River road.

International Nickel Co. has staked out a large anomaly (over 500 claims) in the Fox River area of northern Manitoba, in what appears to be a large basic plug similar to the Mystery Lake and Moak Lake deposits. Mystery Lake deposit is now estimated to contain 50-million tons grading 0.5% nickel. Moak Lake deposit has not been determined. A 1300-ft shaft is now being completed from which 10,000 ft of lateral work will be carried out to provide drill stations to outline the occurrence. It is believed the Moak Lake deposit will carry higher nickel values.

SASKATCHEWAN

A Salt Lake City, Utah, firm will engage in underwater prospecting for uranium ore in the Beaver Lodge Lake north of Saskatoon, Sask.

Treasure Uranium and Resources, Ltd., a subsidiary of Treasure Uranium and Resources, will use underwater scintillation equipment to prospect its claim in the area—three-quarters of which are under the lake, says David A. Robinson, secretary of the firm.

If response is favorable, core drilling through the ice will be conducted this winter. Mining would be conducted from adit established on shore.

NORTHWEST TERRITORIES

Alberta Central Explorations, Edmonton, Alberta, and Regent Uranium-Lithium Explorations, have launched a joint exploration program on lithium dike claims on Great Slave Lake, 30 miles east of Yellowknife, NWT.

Company was formed recently as an amalgamation of Edmonton North Oil Co., Ltd., and Ridley Mines, Yellowknife.

An examining option has been taken on the Reed Lake claims and trenching will be followed by drilling, officials report. The drilling contract is held by Harvey Kendricks Development Ltd.

It was pointed out that as the deposit is more than 8,000 ft long with assay reports around 2.63% lithium, officials of the two companies have decided to assess its potential.

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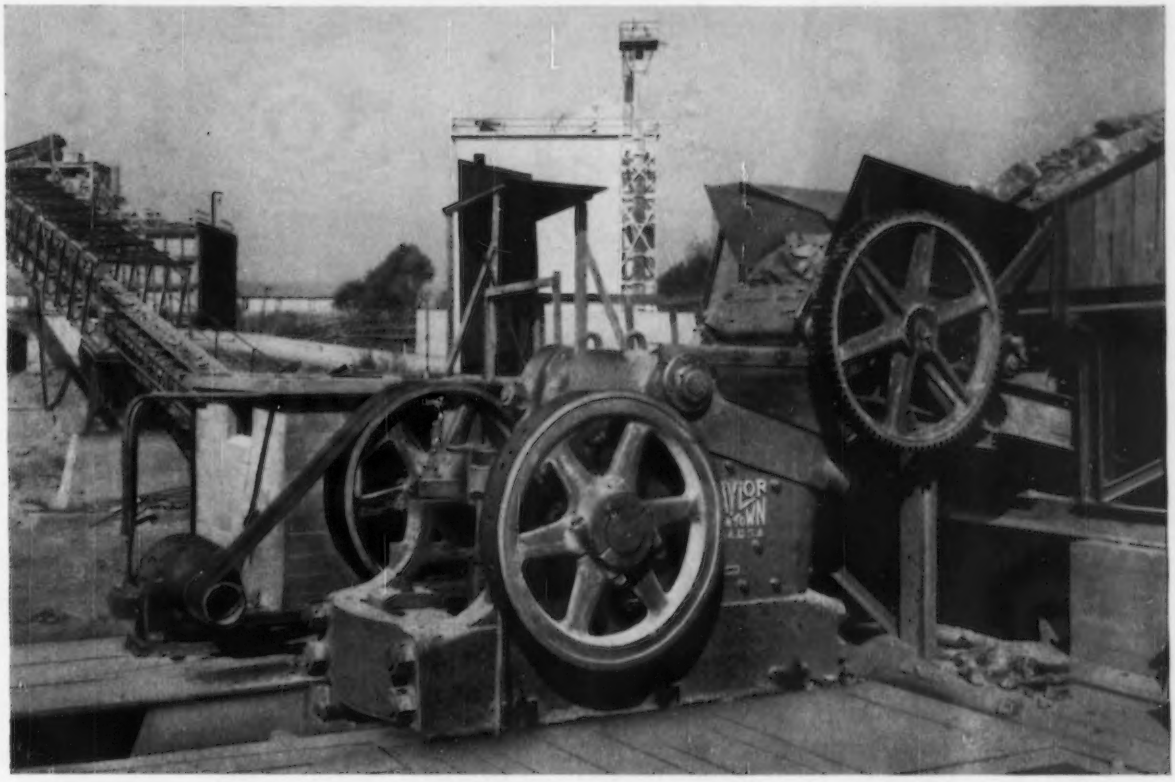

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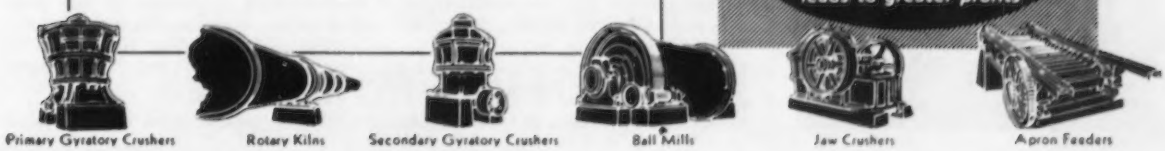

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BIXBY-ZIMMER Engineering Co.

NEW DREDGE will reportedly be used by Texas Gulf Sulphur to dig a mile-long channel from the Coachapan. Deposit is 40 miles up river from Coatzacoalcos.

Texas Gulf Sulphur Co. Moves Into Isthmus of Tehuantepec

TEXAS GULF SULPHUR CO. reportedly expects to have a Frash process plant in operation early next spring on the Isthmus of Tehuantepec, Mexico.

Texas Gulf quietly has been exploring the isthmus for the past two years. Observers believe the world's largest sulphur company was drawn to the area by the success of the three U. S. suphur firms operating there.

Texas Gulf will reportedly have a 1-million gpd plant floated on two barges moored in or near the Coachapan River at Nopalata, about a mile upstream from Salinas, where Gulf Sulphur Corp. is preparing to begin production. Texas' deposit at Nopalata reportedly contains some 1-million proven tons so far. Company is said to have an even larger deposit at Texistepec, about 10 miles southeast of Jaltipan, where Pan American Sulphur Co. now is producing.

Barges, being built by Brown & Root Construction Co., Houston, Tex. at a cost of about $3-million, were launched in September. Napolata concession is said to lie about a mile from the Coachapan River.

First dredge was landed at the nearby free port of Coatzacoalcos in August. Dredge will presumably be used to help dig the 1-mile connecting canal between the operation site and the river.

Speculation as to why Texas Gulf plans to use a barge-mounted plant is that when the company is finished at Nopalata, it may simply float its plant downriver for use at Texistepec. If such a plan were to be carried out, a 6-mile canal would have to be dug from the Coatzacoalcos.

Edward O. Mason, president of Compania Explorada del Istmo, S. A., Texas Gulf's Mexican subsidiary, neither confirmed or denied the information.

IN LATIN AMERICA

MEXICO

A senator from Durango, and chairman of the Senate Mining Commission, Terrones Benitez said that Mexico's present mining taxation policy will precipitate a "grave crisis in Mexico's vital mining industry within 5 to 8 years." He called on the Mexican government to alter this policy, which embraces 19 different taxes that may be applied to mining and which can take from the mining operator 37% of gross receipts.

Senator Terrones Benitez warned that the Mexican mining industry is now in a period of stagnation because of lack of exploration for new mineral deposits.

Modernized operations at Cerro de Mercado, Mexico's mountain of iron in the state of Durango, got under way early this month. New $1-million mechanization program, all but completed at the end of October, has made Cerro de Mercado one of the most up-to-date mining operations in Mexico.

Until recently the mine's high-grade hematite was claimed by primitive methods. This month, however. Cía. Fundidora de Fierro y Acero de Monterrey, S.A., principal stockholder, put into operation a system which spanned centuries in mining technology.

Engineer Salvador Villamar is supervisor of all Fundidora's mines and mining operations. Carlos F. Maldonado is general manager and engineer José Rubio is mine manager at Cerro de Mercado.

Production distribution at the property is set by management as follows: Fundidora 28,000; Altos Hornos 35,000; Sheffield Steel 15,000 and small domestic operators, 2,000.

The rainy season ended early in Octo-

Bethlehem Hollow is used in construction at Erie Mining Company taconite project, north of Aurora, Minn., and at Taconite Harbor on Lake Superior (above). *Plant Contractor:* Foley Constructors of Minnesota (Foley Bros. Inc., St. Paul Minn., and Pleasantville, N.Y.); *Harbor Contractor:* Dravo Corporation, Pittsburgh. Drill steel reconditioned by Barrett Drill Service, Eveleth, Minn.

Moving 4 Million cu yd of Hard Rock for Taconite Development Program

To help conserve the nation's supply of vital iron ore, the Erie Mining Company is playing a leading role in the development of a new industry, taconite mining, near Aurora, in northern Minnesota. The project is a huge one. The rock must be blasted, and crushed to fine powder. The ore, recovered magnetically, is then rolled into small balls, which are specially treated to develop hardness for easy handling. The end product, taconite pellets, has an iron content of more than 60 pct.

Site of the development, not long ago a wilderness, is now bustling with activity. An entire new community has been built. Mill buildings and dock facilities are well advanced, and a railway is under construction.

The operation involves the excavation of approximately 4 million cu yd of hard rock. Bethlehem Hollow Drill Steel, in 1-in. hexagons and 1¼-in. rounds, and fitted with carbide-insert bits, is used exclusively in this task. About 85 pct of the drilling is being done by wagon drill, the rest by jack-hammer. Normal blast-hole depth is 17 ft.

Bethlehem Hollow Drill Steel is ideal for all kinds of rock-removal jobs because it is rolled from a tough, fatigue-resisting steel. It has a wide quenching-range, making it easy to heat-treat for the ideal balance of hardness and wear-resistance. Bethlehem Hollow also makes long-wearing threads and tough shanks. It comes in rounds, hexagons and quarter-octagons, generally in lengths of 18 to 25 ft. It's good steel to keep in mind for your next drilling job.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM HOLLOW DRILL STEEL

TWO GRADES: CARBON • ULTRA-ALLOY (chrome moly)

BETHLEHEM STEEL

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There's no better "air-conditioning" system for underground operations than lines made up of Naylor Spiralweld ventilating pipe and Naylor Wedge-lock couplings. With this combination, lines can be installed quickly, and easily extended as work progresses. The coupling provides remarkable accessibility. Space on only one side of the pipe is required for connection, permitting the line to hug the walls wherever space is limited. With each joint of pipe the same length, any section can be replaced at any time. For push-pull ventilation, you'll do better with Naylor pipe and Wedge-Lock couplings. Write for Bulletins No. 507 and No. 514.

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Mexico *(Continued)*

ber, but late in September the rains dealt one last forceful blow. Hurricane Hilda played havoc with many mines in the northeast central section of Mexico.

One such mine is Aurora Xichu, in the State of Guanajuato, a small lead-zinc property leased by Asarco, S. A., subsidiary of American Smelting & Refining Co. In addition, an important road was washed out so completely that it may be January before the road can be restored to normal service.

Despite adverse conditions the company has managed to keep operations under way at the mine, although on a much-reduced schedule. Normally the mine produces 7,000 tons per month, which is sent to Asarco's smelter at San Luis Potosí. W. A. Conley is general manager at Aurora Xichu.

Gulf Sulphur Corp. reported it has drilled what "is believed to be one of the largest sulphur wells drilled in the world" on its 7,414-acre concession at Salinas, State of Veracruz.

In a letter to stockholders, Lawrence B. Brady, president, said, "During exploration of the company's 7,414-acre concessions, one sulphur well recently cored 695 ft of sulphur-bearing limestone, in accordance with the report of Walter H. Maddox, consulting geologist.

Story of Mexico's sulphur industry on the Isthmus of Tehuantepec appeared in January 1954 *E&MJ*

VENEZUELA

Fiat Motor Co. has confirmed that its tender to the Government of Venezuela for the building of a steel mill in the Matanza area has been accepted. Its estimate is said to have been considerably lower than bids submitted by other firms.

CHILE

Anaconda Mining Co., its two Chilean affiliates, Chile Exploration Co. and Andes Copper Mining, submitted to the Chilean Government a project in accordance with which they would be prepared to make investments for a total of US$ 38,207,000. Of this figure US$ 27,393,000 would correspond to machinery, spares, raw materials, etc., imported to Chile from the U. S. and the balance to goods which would be purchased locally, as well as labor costs.

Besides the above mentioned refinery, the plan contemplates a 40,000-kw turbo-generator for Chuquicamata as well as a new mill, 5 diesel locomotives, 100 Decauville cars, a new 206-bed hospital, new stores, houses and a school.

Rodolfo Michels, vice president of Santiago Mining Co., owner of the high grade Africana mine near Santiago, has announced that this company has decided to invest $2,002,151 in bringing this mine

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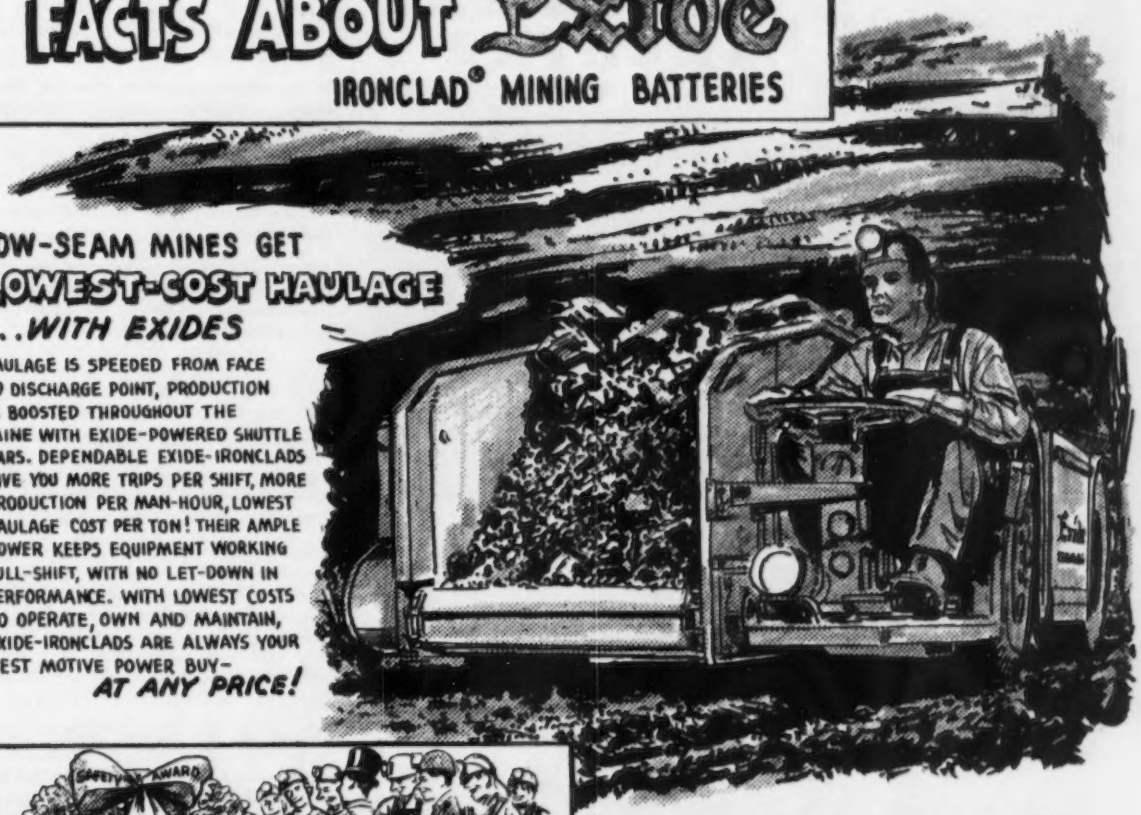

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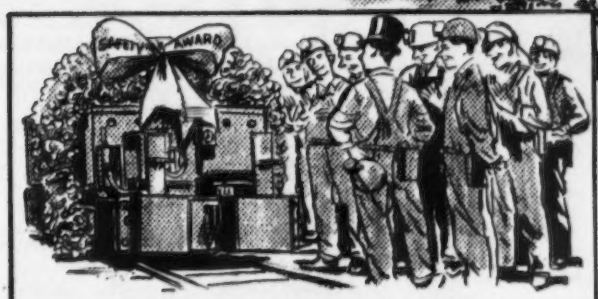

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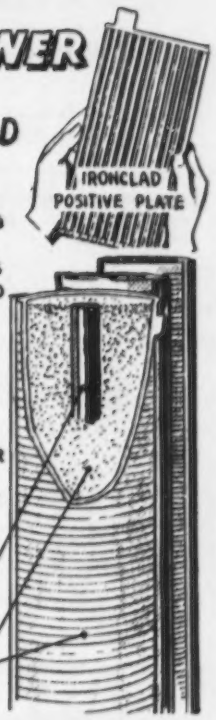

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(2) the Crescent Scraper Bucket.

(3) the operating cables and guide blocks.

(4) a method of shifting.

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Chile *(Continued)*

into production, which will entail sinking of a new vertical hoisting shaft and construction of a 400-tpd mill. Work has already begun in building a new camp which includes 100 houses for employees.

It has been announced that the nitrate industry, the small iron mines and ferromanganese exporters will get a better rate of exchange of 300 pesos per dollar. Natural Chilean nitrate was finding it increasingly difficult to compete in the world's markets with synthetic nitrogen fertilizers.

After many meetings between the Ministers for Economics and Mining and representatives of the U. S. copper mining companies, it was agreed that the rate of exchange for the dollars these companies must spend in the country to pay for the cost of production be fixed at 200 pesos per dollar for the rest of the year. If output exceeds 420,000 metric tons in 1955, the dollars needed to produce the excess over the above mentioned figure will be paid for at a rate fluctuating between 245 and 300 pesos.

Andes Copper Mining Co. is carrying on an active drilling campaign at the Indio Muerto copper deposit located some 20 miles northeast of Potrerillos and an altitude of 11,500 ft above sea level. It has been said that Indio Muerto's grade is better than Toquepala's and that its tonage might be as large.

Drilling at the Mantos Blancos oxide copper deposit located 30 miles east of Antofagasta by Mauricio Hochschild's interests has revealed some 35-million tons leachable copper ore, with another 3.5-million tons possible.

COLOMBIA

Government has published a decree which regulates the discovery, exploitation, treatment and distribution of radioactive materials. Deposits of uranium, thorium, radium and other natural materials which may be used as sources of atomic energy are declared of national reserve. Deposits will be exploited either by the government directly or under contract. All industrial activities related with the exploration, exploitation, concentration, refining and distribution of such materials will be public utilities.

Instituto Colombiano de Asuntos Nucleares (Columbia Institute of Nuclear Matters) will be created as a public organization.

In the exploitation of such materials, the nation will have a participation of not more than 15% of the sales value after the transportation cost from the deposit to the place of sale has been deducted. Royalty will be split between the nation, the Department and Municipality in which the deposits are located.

Free trade and export of such materials are forbidden. All these materials have to be sold by private persons who exploit them to the Instituto Colombiano de Asuntos Nucleares.

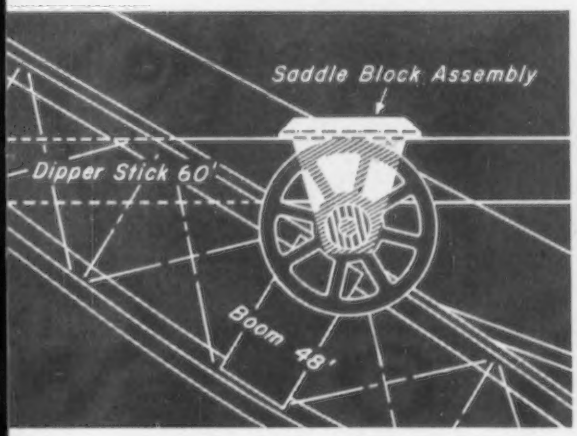
TOUGH "T" STEEL STOPS SADDLE BLOCK FAILURE

THE M. SULLIVAN is a dipper dredge on Lake Erie. It has a dipper stick and bucket that reach 42 ft. below water level, ripping loose 9 cubic yards of rock and hard pan at a swipe. The saddle block, located at the boom and dipper stick joint, provides the digging effort or "crowd" to the dipper stick and bucket. This saddle block is subjected to tremendous stress. In the past, saddle block failure was a common cause of lost time.

In fabricating a new saddle block, a steel was needed that had higher strength without increased bulk, plus resistance to sharp impact at low atmospheric temperatures. That's why tough USS "T-1" Steel was chosen. Strong, tough, weldable, USS "T-1" . . . "met these requirements better than any other material."

USS "T-1" Steel combines low cost with all of these features: *High strength* without weight increase; *impact resistance* at low temperatures; and *excellent weldability* without pre- or post-heating. "T-1" is ideal for use in bridges, mill equipment, rotating machinery, mining or construction equipment and any other equipment which must operate outdoors in extreme weather. The versatility of "T-1" is further proof that only steel can do so many jobs so well.

The dredge M. Sullivan, owned by Merritt-Chapman & Scott Corp., Cleveland, Ohio, scoops 9 cubic yards of rock from the floor of the Ashtabula, Ohio, harbor.



◀ Drawing indicates saddle block assembly's location on 48′ boom. The saddle block provides the digging effort to the 60′ dipper stick.

▶ Mr. Charles Lund of J. B. Lund's Sons Co., Cheboygan, Mich., stands by the saddle block fabricated by his firm. Plates of USS "T-1" Steel from ¾" to 2¾" were sandwiched and edge-welded 1¼" deep. Other operations on the block included straightening and machining.

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Whether you manufacture automobile tires or rubber grommets . . . for that matter, if you work with any substance which produces a particularly stubborn dust . . . Ducon Dynamic Centrifugal Wash Collectors provide the highest efficiency obtainable in wet type collectors.

You can effectively control problem dusts and reclaim valuable fines with the DUCON UW-3 ("package unit", combining exhauster and precipitator. Employing two-phased washing, it has successfully handled such difficult dusts as carbon black, pigments and other extremely fine dusts . . . at better than 99% efficiency.

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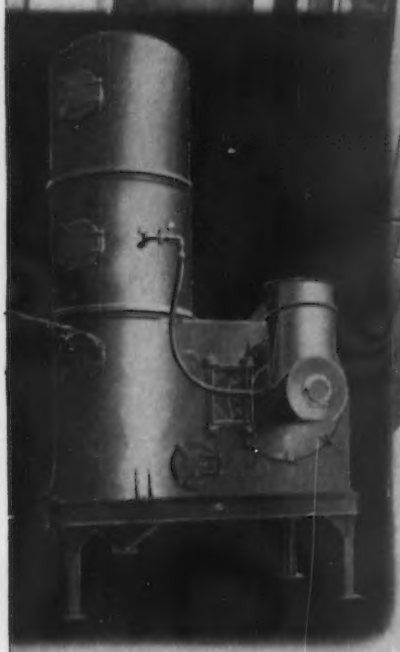
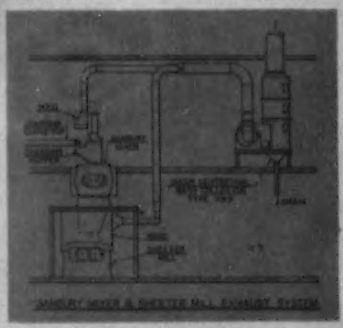


Complete assembly of the Type UW-3 Ducon Centrifugal Wash Collector.



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Colombia *(Continued)*

Uranium deposits have been proven in the northeastern part of Colombia, in the departments of Boyacá, Santander and Norte de Santander. There is, however, no information available as to extension of these deposits. Ore is said to be rather high grade. Detailed surveys of these deposits are to be made by helicopter in near future, Other deposits of uranium ore are known, especially in Cauca Valley, but these are reported to be of very low grade.

No immediate prospects for exploitation and exportation of this uranium ore are in the offing.

BRAZIL

According to local and U. S. mining experts there has been a discovery of a large reserve of pyrochlore (columbium) found at Araxá in Minas Gerais. Estimates so far put the amount to better than 3-million tons.

When the test drillings were analyzed, it was found that there was from 3 to 14% Nb_2O_5 up to 3 meters deep. Deposits containing not less than 1% were found at 45 meters and deeper.

U. S. Bureau of Mines at the Embassy is hopeful that the M. A. Hanna Co. "prospectors" will strike it rich. Hanna has three men in Brazil "looking for anything that can be mined in a large quantity." They have an office set up in the National City Bank Building Sao Paulo. Most of the time they are out tracking down leads of mineral deposits.

Right now Hanna reportedly wants to expand its exploration program in Brazil and needs bi-lingual Brazilian geologists badly. Heading the list of ores that Hanna would like to find are such items as cobalt, nickel, copper, gold and diamonds. Near the bottom of their list, strangely enough, is manganese iron and other ferrous metals. Hanna says it is not so much interested in iron in Brazil, because they already have huge deposits in Labrador and possibly in Africa.

Bethlehem Steel has been working on its joint U. S.-Brazilian 51% capital owned by Icomi manganese mining project in Amapa, a territory at the mouth of the Amazon River. Project is expected to be producing within a year's time, Bethlehem officials say. Bethlehem is also reported looking for new fields in the State of Minas Gerais.

PERU

With the official inauguration on Oct. 23 of the new concentrator at Huarochiri, the Mining Bank will have 5 concentrators in operation. New concentrator, located in an area with many small mines, has a capacity of 70 tpd, but it can be increased to 150 tons.

During the past year, capacity of all the Bank's concentrators have been increased from 450 tons to 1,000 tpd. In addition to the Huarochiri concentrator,

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"Universal Series" METAL DETECTOR

The new Dings Universal Series Metal Detector will detect the presence of all magnetic metals in materials that pass through the Detector Search Coil. Metals are thus detected in material in any form, whether in raw or finished conditions, in bulk or pressed form, liquid or viscous, granular or fibrous state. Even weakly magnetic metals such as manganese steel can be detected by this new, adjustable intensity unit.

Extremely simple in design, installation and operation, the new Dings Metal Detector requires virtually no attention. It is merely necessary to plug the unit into any single phase outlet, place the Search Coil around conveyor belt, and turn on the switch . . . and you have provided protection against tramp metal damage to machinery and product quality at an extremely low cost.

HERE ARE SOME OF ITS OUTSTANDING FEATURES

- **Wide range of sensitivity settings**
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- **Remote location of control cabinet (30-ft. of cable furnished)**
- **Permanent stability (no adjustments necessary—not subject to temperature or humidity changes)**
- **Rubber-mounted search coil completely water-tight**
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- **Low power consumption**
- **Easily installed and operated, even by inexperienced personnel**

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MD155½

Peru *(Continued)*

located in the Province of Huarochiri, Department of Lima, other concentrators are located at La Virreyna, Province of Castrovirreyna; Huachocolpa, Province of Huancavelica; Sacracancha, near Morococha; and Hualgayoc, Province of Cajamarca.

First development on a large scale of oxidized copper deposits by modern methods will be carried out by Cia. Minera Chapi S.A., with completion in 1956 of a 50-tpd leaching plant, which will be increased to 100 tons at a later date. Leaching plant, which will require an investment of 5-million Sol, will produce cement copper of 90% grade.

Chapi deposits are located some 65 km southeast of Arequipa at 2,600 meters (8,530 ft) above sea level and have been worked for the past 30 years by Luis Chabaneix by hand picking methods. It is estimated that some 40,000 tons of hand picked ore, running between 15 and 40% copper have been exported.

Deposits consist of sedimentary layers of quartzite, sandstone and limestone as well as porphyry and volcanic rock. The copper mineral is stratified in various horizontal layers and five are visible to the naked eye on the side of the hills, where mining is now being carried out.

Predominant minerals are oxides such as red copper, atacamite, azurite or blue-copper and chrysocolla. Proved and probable deposits are about 80,000 tons of 3.5% copper. Prospective deposits are estimated at over 1-million tons.

Cia Minera Chapi S.A. was formed in 1954. Lima office is located at Av. Tacna 411.

IN AUSTRALIA

Dept. of National Development has made a new estimate of Australian deposits of iron ore. Middleback Ranges in South Australia are said to contain 176-million tons and Yampi Sound in Western Australia about 72-million tons above high water level. Koolyanobbing deposits in Western Australia contain about 73-million tons and all these deposits contain more than 60% iron.

At the present rate of extraction it is estimated that deposits at Middleback Ranges could last for 50 years and those at Yampi Sound for 70. Present rate of extraction at Koolyanobbing is only about 20,000 tons a year.

Other high-grade deposits are of minor economic importance because of their size and/or location. Low-grade deposits in the Middleback Ranges are stated to contain over 5-billion tons but there is, at present, no interest in these taconites.

Zircon Rutile Ltd. followed its loss in the previous fiscal year (£A7,324) by a record net profit of £A84,222 (after tax).

Aerial surveys for uranium and iron ore are being intensified. A survey for iron ore is being arranged in the western part of Eyre Peninsula and further airborne

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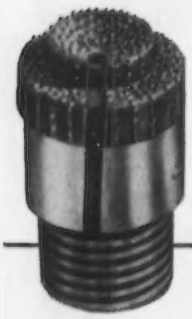

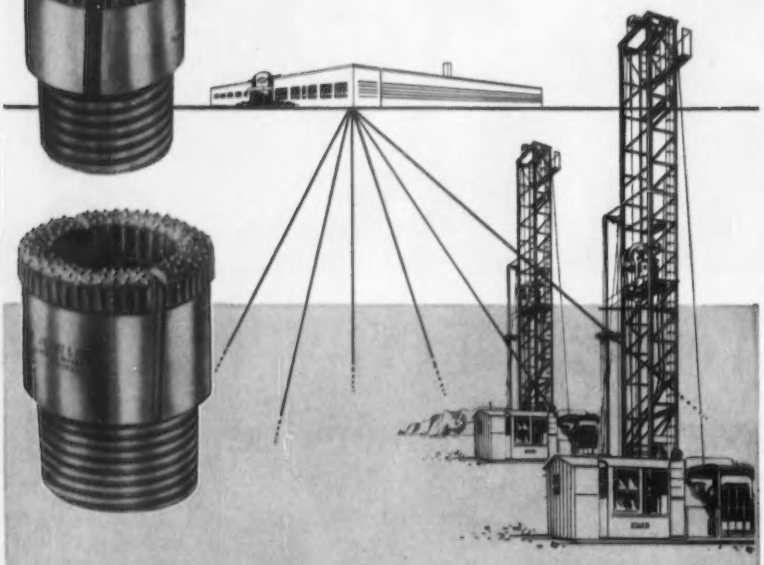

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Australia (*Continued*)

surveys for uranium have been recently completed in the Darwin-Katherine region of the Northern Territory and in the Pilbara district of West Australia. The airborne search for uranium is also continuing in North Queensland (west of Chillagoe and in the Georgetown area) and around Herberton.

Australian Mineral Production (in tons)*

	1953	1954
Antimony conc.	450	220
Antimony in all mine prod.	791	728
Asbestos	4,970	4,713
Barite	5,677	6,900
Bauxite	4,052	4,672
Beryllium ore	125	133
Bismuth conc.	46	35
Cadmium	806	888
Chromite	2,741	4,270
Copper cons.	170,076	194,419
Diamond (Ind.) carats	736	1,565
Diatomite	4,440	4,276
Dolomite	99,642	119,314
Felspar	6,883	13,954
Fluorspar	333	18
Greensand	1,593	1,545
Gold ore and conc.	518	102
Gold, fine oz.	1,075,181	1,117,077
Graphite	15	n.a.
Gypsum	329,992	437,430
Ilmenite conc.	—	471
Iron ore	3,298,718	3,518,804
Iron oxide	11,449	9,806
Lead cons.	428,310	454,163
Limestone	3,077,560	3,385,790
Magnesite	46,397	38,336
Manganese ore	31,515	28,108
Mica bloc, lb.	72,226	84,621
Mica scrap, lb.	—	65,184
Mineral pigments	596	611
Molybdenite conc., cwt.	43	3
Monazite cons.	197	79
Osmiridium, oz.	59	17
Pyrite ore and cons.	167,007	195,458
Quartz crystals	n.a.	n.a.
Rutile cons.	38,039	44,658
Serpentine	395	755
Silica	142,446	39,282
Sillimanite	3,557	2,337
Silver, fine oz.	12,539,152	13,782,657
Tantalite columbite, lb.	18,124	171,767
Tin conc.	2,223	2,833
Scheelite conc.	1,185	1,326
Wolfram conc.	1,008	710
Vermiculite	29	—
Zinc	239,324	254,801
Zircon conc.	27,207	39,903

*Except where noted.

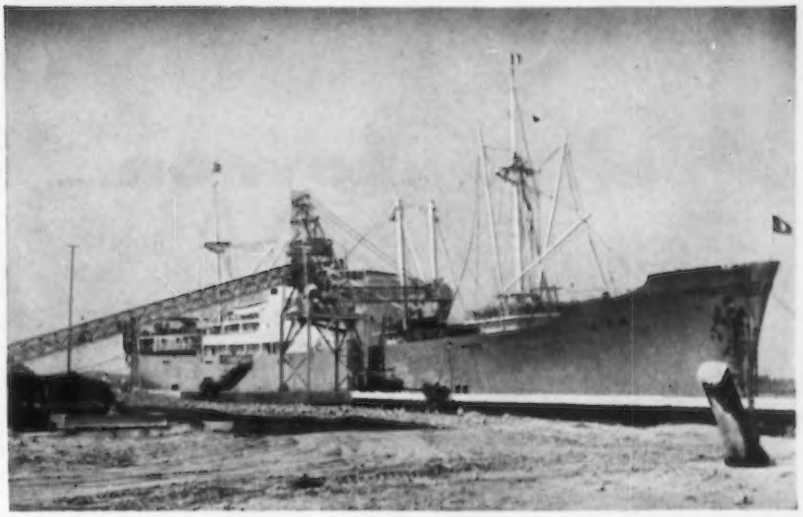
Net profit of Aberfoyle Tin, N.L. in its last fiscal year was £A333,964 compared with previous year's £A334,426.

Northern Hercules, N.L., a new and promising gold mine, reports 13 oz values in the drive north from the main shaft.

Tableland Tin Dredging has resumed normal dividend payments with an 8% dividend, the first since 1950. The company's dredge was moved to the new Smith Creek field in the intervening period and operations were resumed late in 1953.

A new company, in which two of the four partners are Tungsten Consolidated Ltd. and Uranium Consolidated, N.L. was formed to operate a beach sands property at Lennox Heads in New South Wales. Two rutile leases covering about 170 acres are estimated to contain at least 25,000 tons of recoverable rutile. Plant operations will start in March 1956 with

From the Jungles of VERACRUZ



They're Loading Sulphur for the Free World!

with an S-A CONVEYING SYSTEM...

Sulphur is weighed "on-the-run" as it rides slope conveyor to loading tower.

Ship loading boom conveyor in raised position to clear ship superstructure.

Deep in the jungle of the state of Veracruz, Mexico, liquid sulphur flows from pipes probing 600 to 1000 feet into the ground. This is the first sulphur plant using the Frasch process outside the United States.

First put into production in March 1954, the Mexican Gulf Sulphur Company's operation is the result of teamwork of United States and Mexican technicians. Engineered for a production of 200,000 tons per year, the plant has a planned potential of 500,000 tons annually.

After a barge trip to storage and shipping facilities, the sulphur is solidified in vats. Then, blasted loose, it is delivered to a Stephens-Adamson Conveyor System. A traveling hopper with crusher "working over" to belt conveyors, reduces lumps to 6-inch size. Both belts feed to a slope conveyor, running to a loading tower at dockside. Belts have a normal capacity of 400 TPH each.

From the unloading tower, sulphur moves out on a boom conveyor for ship loading, or is directed to a chute for loading railroad cars.

Another good example of S-A engineering to meet a specific need for economical handling. What is *your* problem? We'd like to help you solve it. Just write for full details.

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70 TO GROW ON...

1955

Seventy years of close association with mining and metallurgy have provided Stearns-Roger a vast store-house of technical process and plant information. Starting with plant location studies and the development of flow sheets, complete mineral processing plants have been designed and built, in whole or in part, for many of the major ore processors in this country.

Stearns-Roger experience has been of real help to producers of taconite, molybdenum, copper, lead-zinc, vanadium, uranium, chrome, cobalt, potash and other minerals. These projects include modernization programs, additions to existing facilities and complete new plants.

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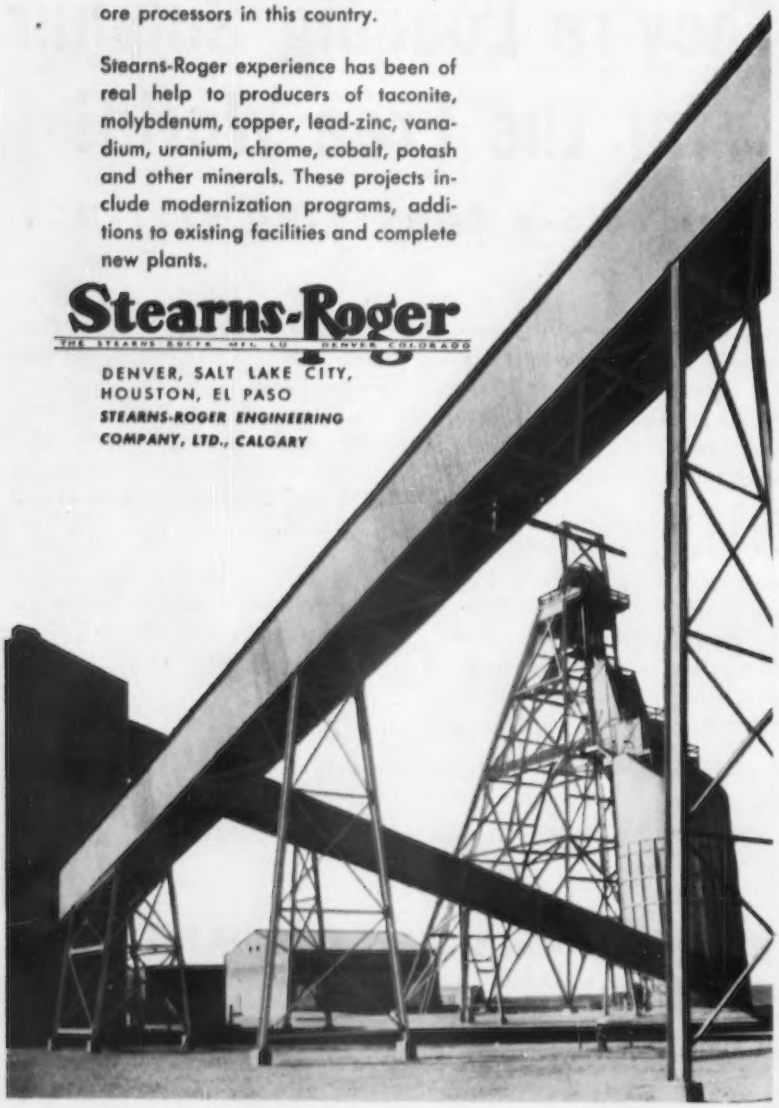


Australia *(Continued)*

an initial throughput of 200 tons a month.

Tennant Creek field is booming. Unprecedented activity is reported from the area where four large companies are installing modern equipment. Companies are Peko, Australian Development, Eldorado and Merloo. Wolfram prospects are also improving and the Government battery is operating on lease at Hatches Creek where additional good reserves of high-grade ore have become available.

Australian Uranium Corp., N.L. has found patches of high-grade pitchblende at the No. 2 level of its No. 5 shaft at Adelaide River.

Wattle Gully Gold Mines, N.L. earned a net profit of £A42,303 in its last fiscal year compared with previous year's loss of £A1,363.

A development regarded as "most encouraging since inception" is reported by Enterprise of New Guinea Gold N.L. Quartz porphyry and intersected quartz leaders and veins were found in the second of two adits being driven through rough rock adjoining Enterprise No. 12. Samples weighing 450 lb yielded on pan treatment 23 oz of gold.

Great Western Consolidated, N.L. is planning for an increased monthly gold production. Company's experts expect larger orebodies to appear in depth at Copperhead and beginning of production at Fraser's mine to carry it through mine development.

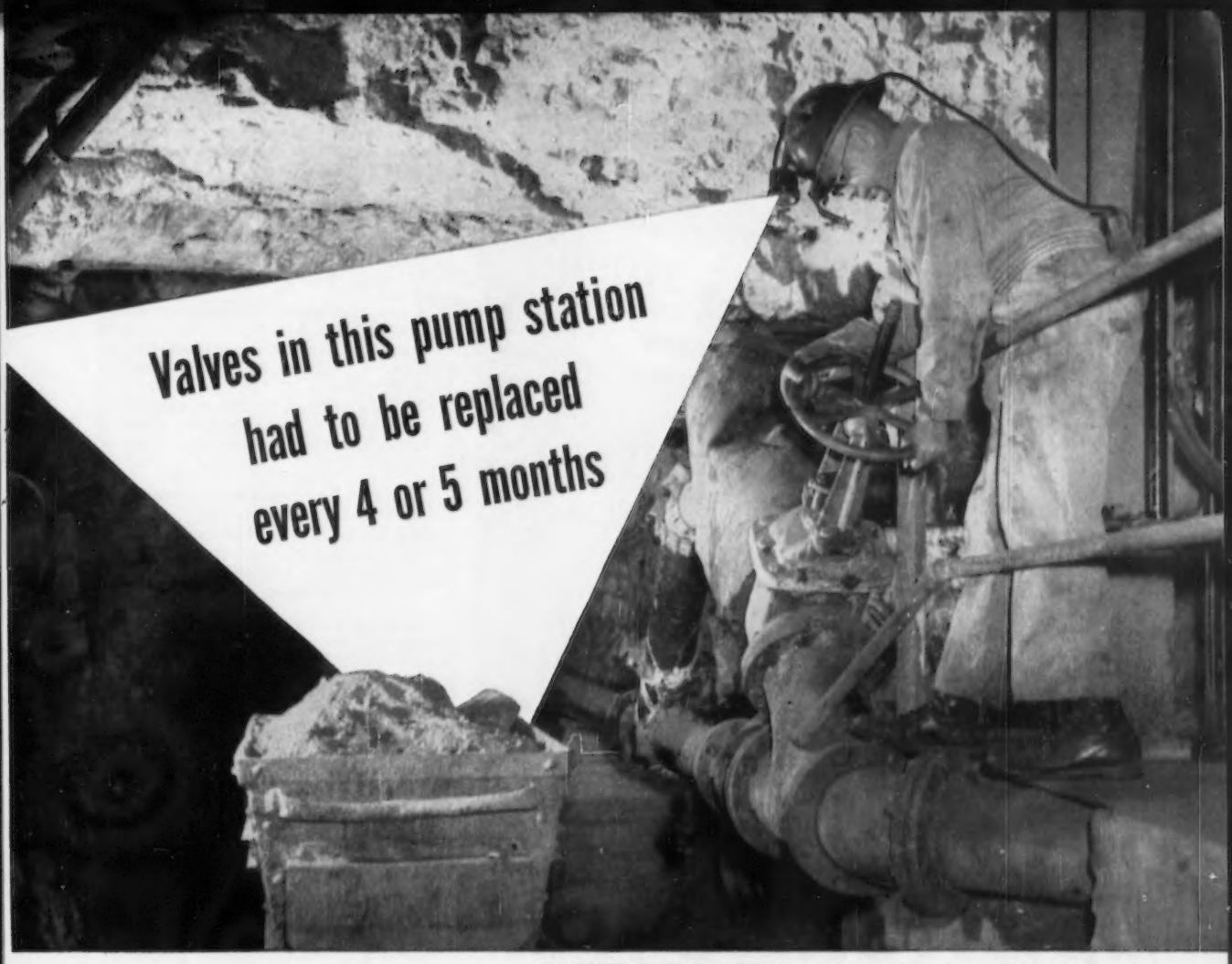
Drilling at the El Sharana mine has disclosed further uranium ore about 40 ft off the main orebody. It is not yet known whether this discovery indicates parallel lodes or a lateral extension of the main occurrence.

Kowmung Mines Pty. Ltd. reports that the survey of the Mt. Werong silver lead mine at Oberon (New South Wales) has revealed that the No. 5 orebody assays 19% lead, 10 oz silver, 14% zinc and just under 1 dwt gold. Examination of the other six orebodies is under way.

IN THE PHILIPPINES

Government's Gold Subsidy Board is considering a plan to subsidize the entire gold output of Philippine mines at prices of 101-103 pesos per oz ($50½-$51½). Only about one-third of the mines total production receive the present subsidy which for marginal mines provides for a price of 111 pesos ($55½) per ounce. Repeal of the 17% exchange tax on Jan. 1, 1956 is confidently expected to encourage foreign investment in Philippine mines.

Hixbar Mining Co. announced that its Rapu-Rapu copper mines in Albay province will shortly be placed in production. Paul A. Schafer, consulting geologist, has



PLANT CHIEF HAROLD STIENMIER adjusts a Stainless Steel valve on eight-inch pipe carrying corrosive mineral waters deep inside the Gilman, Colo. mine of Empire Zinc Division.

until Stainless Steel took over the job

HIGHLY mineralized and extremely corrosive water took its toll of mine pump valves at the Gilman, Colo. operation of Empire Zinc Division, The New Jersey Zinc Company, until Stainless Steel provided a lasting answer to the problem.

Harold Stienmier, plant chief at the Gilman operation, tells the story: "Mild steel brass-trimmed valves were having to be replaced every four or five months due to corrosion from the mine waters. We started replacing them with Stainless Steel valves and they are as good as the day we put them in."

"The day we put them in" was 1944 in some cases . . . making them 10 years old. So, even though Stainless valves cost three times as much as valves formerly used, they paid for themselves the first year and have given nine years of almost cost-free service since.

This is but one of many cases where Stainless Steel has proved beyond doubt that it is the most economical material you can use where corrosion and abrasion present a problem. It is a versatile material, able to handle all kinds of jobs and handle them well.

If you have spots in your equipment where premature failure is adding to your production costs, give Stainless Steel a trial. And when you do, be sure it is perfected, service-tested USS Stainless Steel.

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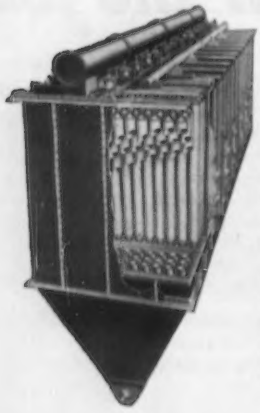
By "constant" we mean what operating men *expect* it to mean when applied to dust collection — *no* loss of suction drop, *no* down time, *no* variation in capacity.



Norblo's unit compartment system, with automatically controlled progressive and cyclic bag cleaning maintains the full capacity for which the particular installation is engineered. Bag cleaning is easily regulated if dust loading rate should change. Only one compartment is cut out at a time for cleaning (and that for only a few seconds) by means of moderate shaking which insures long bag life. A small quantity of reverse air is used to prevent unwanted dust flow during shaking operation. Excess dust is dropped without destroying the desirable basic filter cake.

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Philippines *(Continued)*

estimated the property to contain a reserve of 305,000 tons of 3% copper ore.

Surigao Consolidated is examining a new copper prospect in Zambales province. Work will be started immediately under direction of Nestorio N. Lim, formerly chief valuation engineer of the Bureau of Mines.

A new mining and development company capitalized at $1,250,000, was recently organized and registered as Philex Mining Corp. by a group of local and foreign businessmen.

Philex will develop raw prospects to a point where it may either offer them to other financial interests or work it themselves.

Philippine Iron Mines has reportedly located uranium running 1.5% U_3O_8 in drill holes on their copper-molybdenum properties. Company expects that uranium as by-product will assure economic success of the operation.

During the latter part of August, new mercury extraction plant of Palawan Quicksilver Mines, Inc., went into trial operation on low-grade ore. High-grade ore will follow low-grade pilot run.

Itogon Mining Co. treated 13,828 tons of ore, for a recovery of 3,269,252 oz gold in August, an increase over July.

The dredge "Mary Angus" of Coco Grove, Inc., Paracale, Camarines Norte, handled 142,700 cu yd for a gold recovery of 649,637 oz. This compares with 661,010 oz gold from 131,600 cubic yards in July.

Marsman-managed mining companies reported a combined increased production of $315,966.62 during August, compared to $292,216,325 for July.

San Mauricio Mining Company in Jose Panganiban, Camarines Norte, milled 10,414 tons of ore in August for a recovery of 1,633,470 oz gold, 5,810,182 oz silver, 25,224 lb copper ,and considerable lead.

Preliminary investigations of the copper-iron ore deposits at Bagacay have shown that the area may eventually become a rich copper producer. In one sector alone, at least 15,000 tons are fairly well exposed and assayed as high as 23% copper. In another section the ore body has been traced over a distance of 400 ft. Assay is over 27% copper.

Iron ore reserves of the area are put at over 3-million tons averaging nearly 54% iron. Deposits are owned by Marinduque Iron Mines Agents Inc.

Lepanto Consolidated Mining Co. recently shipped 5,283.5 wet metric tons of copper and gold concentrates, including a small amount of silver.

Railway recently completed on property of Consolidated Mines, to haul chrome ore from mine to pier at Masinloc has cut haulage costs two-thirds over former private trucking firm reports.

SEND FOR THIS 32 PAGE MULTICLONE BOOKLET

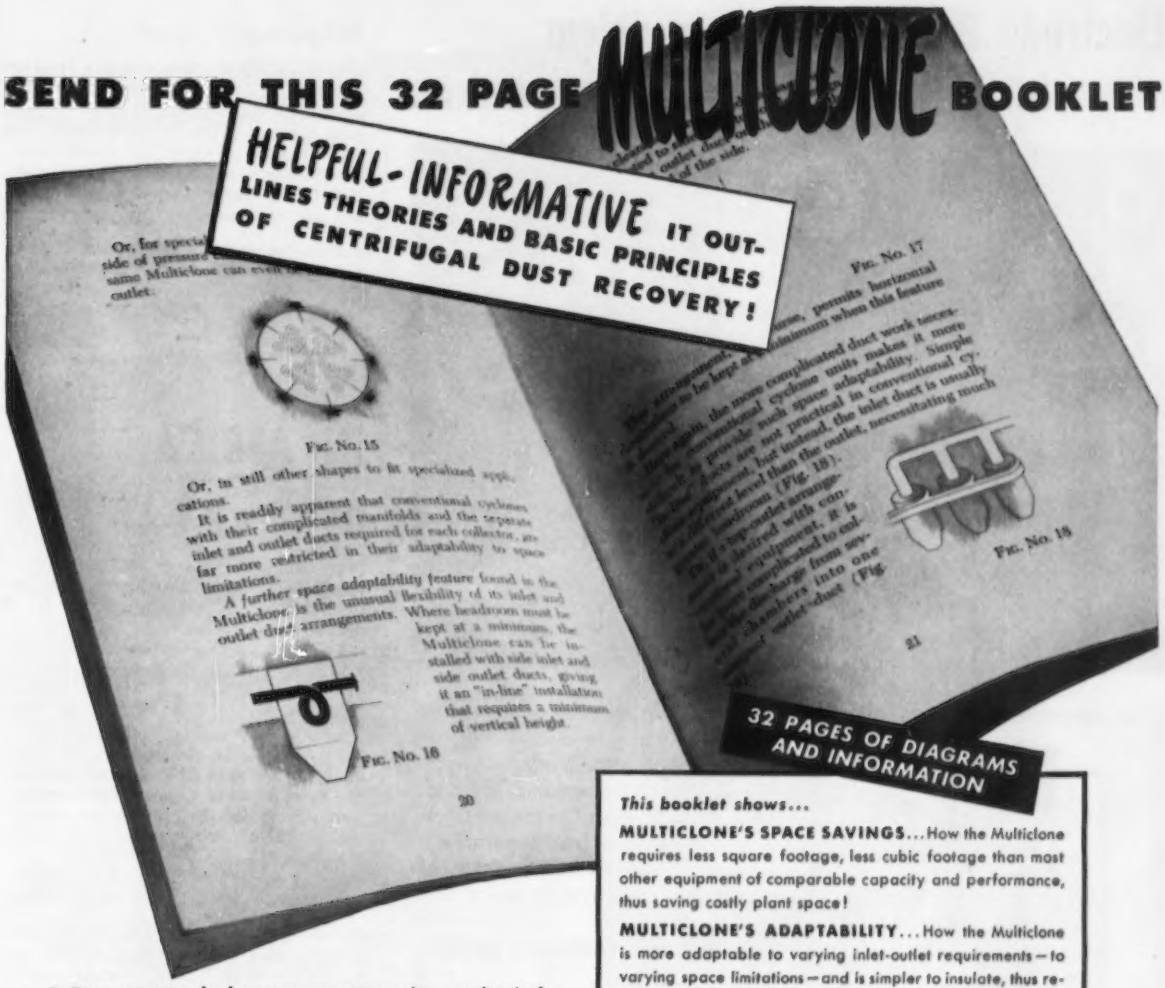
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Fig. No. 15
Fig. No. 16
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32 PAGES OF DIAGRAMS AND INFORMATION

NO MATTER whether you are now using mechanical dust recovery equipment or are planning the installation of such equipment at some future date, here is a booklet that is full of helpful and valuable information on centrifugal dust recovery. It not only explains the basic methods and principles involved, but also shows the important differences between small and large diameter separating tubes, shows how to simplify your duct work and reduce installation costs, and outlines many other important factors to be considered in selecting mechanical dust recovery equipment.

In addition, this informative booklet illustrates and explains how MULTICLONE'S unique *vane* design is fundamentally different...how it makes possible greater compactness, simpler installation, high recovery of the small particles as well as the medium and coarser ones, and many other facts on MULTICLONE advanced design.

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MULTICLONE'S EFFICIENCY...How Multiclone's multiple *small diameter* tubes, made possible by its exclusive *vane* design, give higher centrifugal forces and more complete cleansing of *all* suspended particles—even small ones of 10 microns and less!

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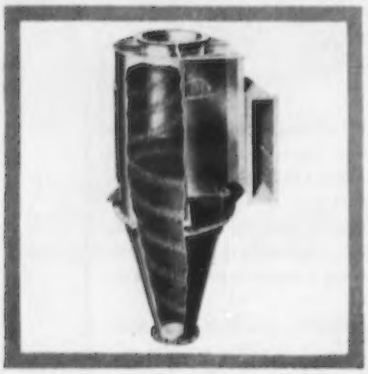
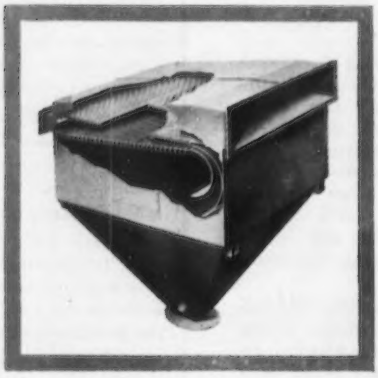


Besides eliminating efficiency drops and "shutdowns" due to electrode breakage, Buell's unique Spiralectrode permits higher and more constant emission, extra efficiency. Also, Continuous Cycle Rapping—another Buell exclusive—keeps electrodes constantly clean for maximum efficiency...at all times!



Buell Cyclones offer two "extra-efficiency" advantages: (1) exclusive shave-off which harnesses double-eddy and puts it to work, and (2), large diameter design which eliminates clogging.

Buell's Low Resistance Fly Ash Collector combines top efficiency with low draft loss, for natural or forced draft installations. Ideal for boilers from 100 to 2000 BHP.

For more specific data about Buell's *extra efficiency*, write Dept. 19-K
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Experts at delivering Extra Efficiency in

DUST COLLECTION SYSTEMS

Philippines *(Continued)*

Masara gold mine was expected to complete its 250-ton flotation-cyanide mill soon. This will be the first and only new gold mine to begin operations since the war. Property is located in Davao province in southern Mindanao and is operated by the Samar Mining Company, an Elizalde enterprise.

Petition of Atlas Consolidated Mining and Development Corp. for tax exemption under Republic Act No. 901 was recently denied by the Department of Finance, upon recommendation of the Agriculture Department.

IN AFRICA

British Atomic Energy Commission will open an office in Salisbury before the end of this year to carry out uranium prospecting on its own account and to help other uranium prospectors throughout the Rhodesian Federation, it is officially announced.

Southern Rhodesia's Director of Geological Survey, J. C. Ferguson, said in an interview that the Atomic Energy Commission was anxious to see that Southern Rhodesia's uranium prospects were thoroughly investigated in view of the fact that a great deal of uranium had been found to the north of Southern Rhodesia in the Belgian Congo and to the South of Witwatersrand in South Africa.

So far no economic deposit of uranium has been found in Southern Rhodesia.

Mrima Hill, Kenya, has shown 13% rare earths and 6% niobium in drilling by F. W. Binge and J. A. Vorster, representatives of Mines and Geological Department, who have been working on the deposit with about 45 African helpers. Deposit is on the shore of the Indian Ocean, 50 miles south of Mombasa.

Hartebeestfontein Gold Mining Company Ltd. announces that by arrangement with the Atomic Energy Board of South Africa, it will erect a 100,000 tons per month plant for the extraction of uranium from gold slime residue. Contract with Board will be for sale of uranium over a period of ten years from Jan. 1, 1957, and construction work at the mine will commence immediately.

Price payable for the uranium will be related to the cost of production on a basis which will provide for the redemption of the capital cost of the plant plus interest together with a reasonable margin of profit on the capital investment.

Preliminary estimate by the South African Department of Excise and Customs puts the value of exports of prescribed materials (uranium and thorium) under the Atomic Energy Act in June at £2,582,707 compared with £2,196,614 in May. Cumulative total for the first six months of 1955 is £12,497,001 against £5,844,065 in the corresponding period of 1954.

A conveyor belt made by S. A. Rubber

for GREATER CAPACITY and BETTER SCREENING . . .

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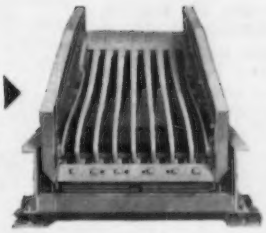
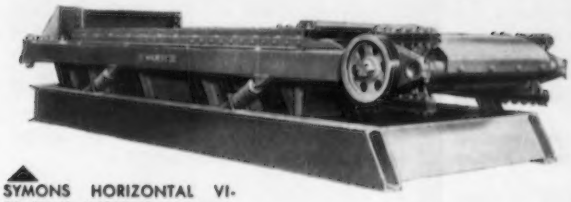
SYMONS VIBRATING BAR GRIZZLIES for heavy duty large capacity primary scalping where clear spacings of 1½" and larger are permissible. Up to 500 tph, handling feeds ranging to 30" and larger.



SYMONS VIBRATING ROD GRIZZLIES for heavy duty big capacity scalping. Up to 500 tph, for feeds up to 12". Ideal for scalping operations requiring relatively coarse separations in the range between 1" to 4".

SYMONS ROD DECK SCREENS employ a highly efficient screen deck utilizing individual replaceable steel rods. Features low screening cost—big capacity—low maintenance — long life — ideal for moist and sticky materials.



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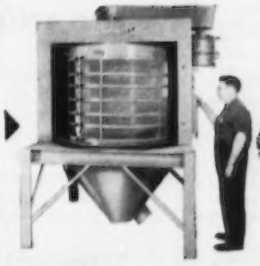

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Africa *(Continued)*

Mfg. Co. has just completed moving 12-million tons of rock on a local gold mine, beating previous record by 60%.

The company has just supplied one belt 5,000 ft long and others over 4,679 ft to link the Sigma Colliery with SASOL, the newly opened oil-firm-coal plant in South Africa.

Total revenue from South Africa's mining industry for the first six months of this year amounted to approximately $340-million, $56-million more than for the comparable period of 1954. Total for the full year is expected to reach about $700-million. Gold output and exports of radioactive materials was $280-million for the half-year against $246-million.

First dividends from the new Orange Free State gold fields have been declared. President Brand is to pay 14c a share, President Steyn 7c and Western Holdings 21c. These are the first returns on the $420-million which have been invested in this area in mines and new towns since the end of World War II. Present rate of earning of the existing nine gold producers is running at $85-million a year and by March next year should be around $140-million, excluding revenue from uranium recovery.

After a break of more than 42 years the Kansanshi copper mine in Northern Rhodesia is expected to start producing on a small scale in 1957. Mine, about 100 miles west of Nchanga and six miles south of the Rhodesian-Congo border, is being equipped to mill 12,000 tons ore a month with a mill grade of about 3.5%.

Associated Manganese, one of the two major manganese producers in South Africa, is likely to exploit the rich iron ore reserves associated with its manganese deposits in Postmasburg. It is reported that Italian undertakings are interested in joining with the company to this end.

Steps are being taken to relax the secrecy provisions of the South African Atomic Energy Act along the lines announced by the U. S. AEC. It is still felt here, however, that the restrictions on prospecting, which cannot be undertaken without a license from the Government, should be lifted, particularly as this is being encouraged in all other countries.

August output of Rhokana Corporation's cobalt plant of 113,098 lb cathode metal and 57,750 lb of cobalt carbonate was a record. If this can be maintained annual output will be over 2-million lb. Work is progressing towards installation of a FluoSolids reactor at new Ndola plant.

Agreement has been made between New Consolidated Gold Fields and a subsidiary company of Rhodesian Selection Trust to carry out mineral prospecting operations in Northern Rhodesia over an area of 19,000 sq mi in northwestern portion of the territory, bounded on the north by Belgian Congo and on the west by Angola. The work will be spread over about four-year period.

TWO NEW EXTRA-SENSITIVE GEIGER COUNTERS by RCA!

MODELS WF-15A and WF-16A . . .

recommended especially for professional prospectors, laboratories, schools, industry.

- Rugged all-weather stainless steel cases easy-to-decontaminate
- Compact, portable, lightweight
- Connectors for attaching probes with extension cables up to 2000 ft. long
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Both models supplied complete with all tubes, batteries, headphone, top-grain leather carrying case and shoulder strap, radioactive test sample, AEC booklet—"*Prospecting With A Counter*"—and operating instructions.

RCA Geiger Counters are manufactured with top-grade components and superior workmanship. They are designed to withstand the tough requirements of professional prospectors. RCA Geiger Counters assure dependable performance even under severe operating conditions — desert heat, high humidity, and mountain altitudes. SEE YOUR RCA DEALER FOR A DEMONSTRATION. For literature, write RCA, Commercial Engineering, Sec. K-66-MM, Harrison, N. J.

†List Prices (Optional)

MODEL WF-15A...$475.00†

- 3 counting ranges: 0-1,000; 0-10,000; 0-100,000 Counts per Minute (CPM)
- Uses a bank of ten 1B85 Geiger-counter tubes
- Useful in aerial surveys up to 1000 ft.
- Indicates radiation to 500 ft. each side in carborne surveys.

MODEL WF-16A...$750.00†

- 3 counting ranges: 0-2000; 0-20,000; 0-200,000 (CPM)
- Uses ten extra-sensitive 6306 bismuth-type Geiger-counter tubes inside case
- Useful up 1000 ft. in aerial surveys
- Indicates radiation to 1000 ft. each side in carborne surveys.

Note: Four popular-priced models are available—$119.50-$186.00.†

RCA RADIO CORPORATION OF AMERICA
Radiation Detection Equipment Harrison, N. J.

IN EUROPE

FINLAND

Large deposits of iron ore have been discovered on the ocean bed just off the Baltic island of Aland. The Finnish owned island lies northeast of Stockholm, at the entrance to the Gulf of Bothnia. Experts are now studying the possibilities of mining the deposits.

SWEDEN

Graengesberg Co. has announced that it will resume mining in the Straassa iron mine in Bergslagen in central Sweden. Ore in Straassa has a relatively low percentage but deposits are the second largest in central Sweden. Mine was abandoned in 1923 due to bad business conditions.

Company will invest 50-million crowns in this mine and give it a capacity of 430,000 tons concentrate with an iron

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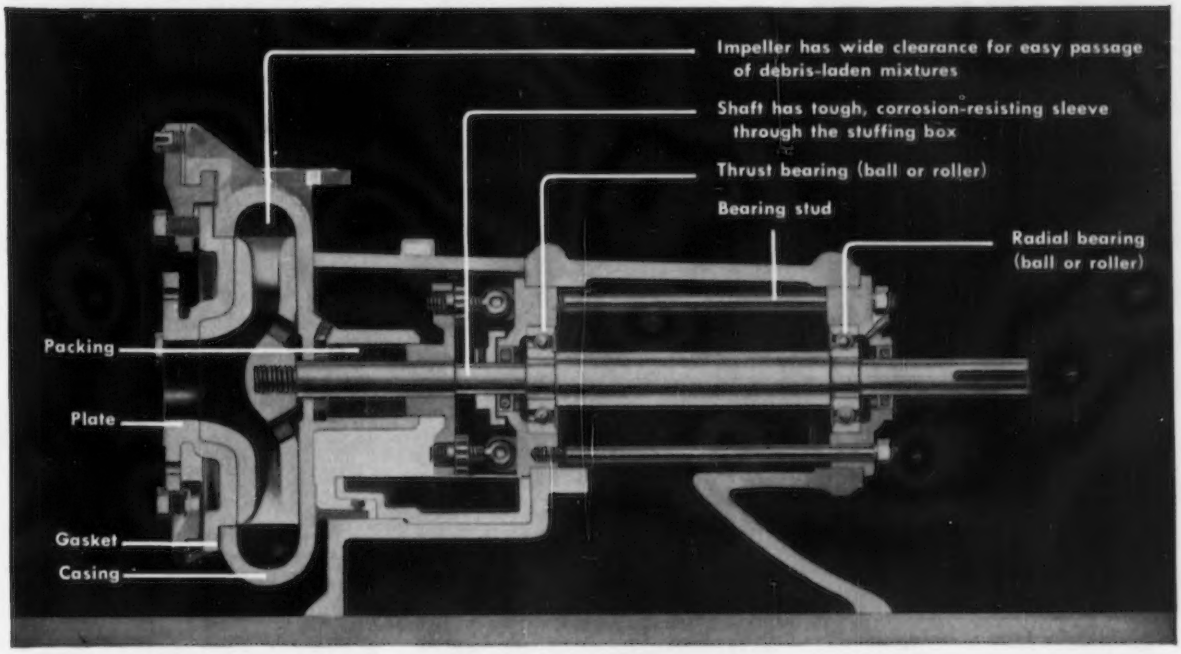
job-rated for grueling service



Compact design of Amsco Mining Pumps is shown here. There are only 3 parts (casing, impeller and end plate) exposed to the grinding flow of abrasive or erosive materials.

Amsco pumps stay on the job longer because they're designed especially to handle pump punishing materials such as abrasives or heavy solids.

Special wear-resistant metals are used in Amsco pump parts so they will stand up longer in abusive service. And, when repairs are needed, you'll save on labor costs because Amsco pumps are compactly designed. It takes fewer man-hours to disassemble and assemble Amsco pumps because of their simple design.

An Amsco pump specialist, with experience gained in many different installations, can help you analyze your operation and recommend the type of Amsco pump best suited for your application. Standard size Amsco pumps range from 6″ to 16″ discharge openings. Larger sizes are also available. Write for Bulletin No. 548IP which gives specifications and complete data on the Amsco pump line. Amsco also manufactures a complete line of hardfacing welding equipment...both rods and machines.

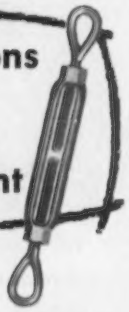
AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Ill.

Turnbuckle Allows Easy Take-up

Several important advances in design by the makers of famous Laughlin Turnbuckles offer added safety and efficiency to turnbuckle users. For fast, easy take-ups with a wrench, Laughlin turnbuckle bodies have extra-heavy hex ends. An exclusive eye design that takes the ear of a shackle one size smaller, gives the Turnbuckle double usefulness Laughlin's exclusive eye design is stronger than conventional eyes because it conforms more closely to the lines of pull. This design also makes it easier to attach thimbles and other fittings. Redesigned Laughlin hooks have added heft at points of greatest stress. Exceptionally strong, the ¼" hook is actually stronger than most ⅜" hooks. Hot galvanized and forged from special forging steel with weldless construction, Laughlin Turnbuckles are offered in a complete range of end fittings in sizes from ¼" x 4" to 2¾" x 24". A reference chart in Laughlin's free catalog lets you select the proper size Turnbuckles for the wire ropes, chains or assemblies you use. For greater safety and strength, always specify world-famous Laughlin Turnbuckle..

Combinations For ANY Turnbuckle Requirement



For free catalog, write:

THOMAS LAUGHLIN DIVISION
American Hoist & Derrick Co.
St. Paul 1, Minnesota
makers of world-famous Crosby Clips

World's most complete line of fittings for wire rope and chain

Sweden *(Continued)*

content of 70%. About 360 workers will be employed in Straassa. Full production is expected to begin in 1959. Ore will be used both on the domestic market and for export.

Government of Sweden decided Sept. 22 to redeem the privately owned shares in the large iron mining company Luossavaara-Kirunavaara Aktiebolaget. Redemption price is calculated at nearly U.S.$ 200-million.

The redemption will take place on Sept. 30, 1957, with one-fifth of the redemption sum paid on that date and the rest paid one-fifth at a time each Sept. 30 for a total of five payments.

AUSTRIA

Bleiberger Bergwerks Union (Montan Union of Bleiberg, Carinthia province, Austria) opened the zinc processing plant on Sept. 9, 1955, following a brief ceremony. Plant is located near Gailitz Arnoldstein in Carinthia.

Planned and constructed within three years, the zinc plant has cost roughly $3-million (of which U. S. through the ERP counterpart funds helped with $2.8-million), while the enterprise itself paid balance. This plant is the end of BBU investments, since all ERP funds are tapering off.

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PALO ALTO, CALIFORNIA

Why this feeder doesn't cave in

● The reason is simply this: *The* PIONEER-ORO *Feeder is the most rugged feeder ever built.*

Take a look at its massive pans . . . cast from a special wear-resistant manganese steel, heavily ribbed, reinforced, and all the way from 3/16" to 1" thick, depending on width of feeder. The pans are supported by heavy, closely-spaced manganese steel rollers, keyed 3 to a heavy diameter shaft. Each shaft turns in 3 heavy-duty bearings rigidly supported on the feeder frame.

Takes heaviest dump loads

The PIONEER-ORO is designed for the roughest, toughest feeding jobs on earth. It withstands the impact of the heaviest dump loads. It shrugs off abrasion from hard ores, slag, flintrock, granite, and other coarse, heavy materials.

But the mighty PIONEER-ORO offers more than sheer, brute strength. It is a smooth-running, finely engineered unit designed to deliver a constant flow of heavy, abrasive material, with a minimum of maintenance. Even preventive maintenance costs are low.

Rivetless pans overlap and interlock

Pans, for example, overlap and interlock to provide added stability and stop leakage and spilling. Upturned end flanges also reduce loss of material. Drive links are cast as an integral part of the pan, so there are *no bolts or rivets that can loosen.* Easily replaced link bushings need no lubrication.

Sprocket teeth are readily reversed or replaced without taking the sprocket hub from the shaft or even disconnecting the pans. Like all other wearing parts, these teeth are cast from special wear-resistant manganese alloyed steel.

Supporting rollers and shafts can be removed, too, without disturbing the pans.

OTHER FEATURES

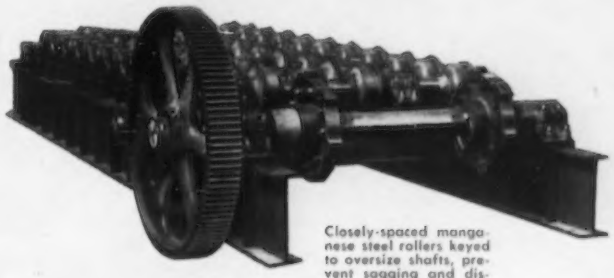
1. Patented lugs in pan links remove dirt, make links self-cleaning.
2. Feeder can be made to run in either forward or reverse direction.
3. Available in standard widths up to 84", widths in excess of 84" by special order, and lengths as required.
4. Made with 6", 9", 12" or 15" pan pitch (depending on width) to fit available head room.

PIONEER-ORO FEEDER
Capacities in tons per hour

Travel per Min.	Width of feeder						
	30"	36"	42"	48"	60"	72"	84"
10'	74	108	147	192	300	432	588
15'	112	162	222	289	450	648	888
20'	148	216	294	384	600	864	1176
25'	186	270	368	482	750	1080	1472
30'	223	324	442	577	900	1296	1768

Ask Your Feeder Salesman These Questions

1. Are pans made from special manganese steel? How thick?
2. Are pans and links cast together so they are rivetless?
3. Can manganese parts be replaced without disassembling pans?
4. Will pans support themselves without rollers?



Closely-spaced manganese steel rollers keyed to oversize shafts, prevent sagging and distortion of pans.

Note the turned-up end flanges and corrugated surface of heavy-interlocked pans; also absence of rivets.

For further details and specifications regarding full line of PIONEER *Feeders, write Pioneer Engineering Works, Inc., Minneapolis 13, Minn. (subsidiary of Poor & Company, Chicago) or see your nearest* PIONEER *Distributor.*

BUY BOTH! HIGHER OUTPUT LOWER UPKEEP

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Pioneer Engineering Works, Inc., 1515 Central Ave., Minneapolis 13, Minn.
Subsidiary of Poor & Company • Chicago

Please send information on equipment checked.

- ☐ GRAVEL PLANTS ☐ WASHING PLANTS ☐ MECHANICAL FEEDERS
- ☐ ROCK PLANTS ☐ BITUMINOUS PLANTS ☐ VIBRATING SCREENS
- ☐ JAW CRUSHERS ☐ APRON FEEDERS ☐ BUZZER SCREENS (LIGHT DUTY)
- ☐ ROLL CRUSHERS ☐ ORO FEEDERS ☐ CONTINUFLO CONVEYORS

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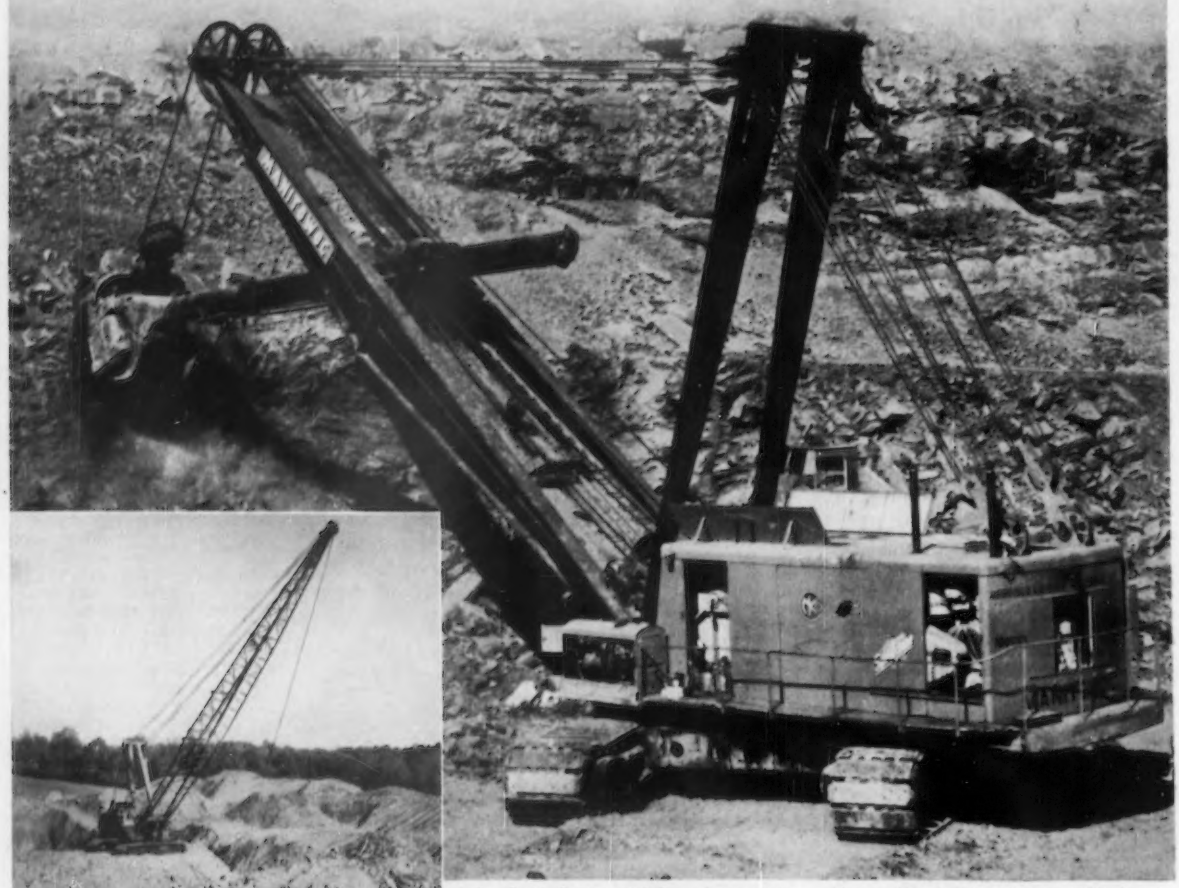
Powerhouse in the Pit!



Left: E. N. Turner and Sons move more overburden per shift with their Manitowoc 4500 dragline near Harrisburg, Pa.

Above: This M-K Manitowoc 4500 shovel with high-lift boom makes fast work of stripping operation at Kemmerer, Wyo.

TORQUE CONVERTER FEATURES

- PRECISE CONTROL by either hand throttle or foot accelerator without slipping clutches or shifting speeds.
- BALANCED POWER LOAD for economy of operation — load requirements and engine horsepower automatically balanced.
- UNLIMITED SPEEDS without shifting since speeds and power are equal at all times.

MANITOWOC
SHOVELS 1-5 YD. Speedcrane CRANES 20-100 TON

Manitowoc 4500 Loads Out Greater Tonnage for Peak Production

Manitowoc 4500 shovels and draglines are boosting stripping and loading records in every mining area of the country. These powerful 4-5½ yd. excavators boost output substantially for profit-conscious operators who require the 4500's power and stamina.

High on the list of preferred features is the 4500's ability to take rock digging shock, shift after shift, with little downtime. The extra-strength, high tensile steel shovel boom has heavy, "bridge-built" side beams; tubular dipper stick turns in the saddle to absorb all digging stress and strain; positive-action torque converter matches engine power to the load; special 60′ high-lift booms extend shovel digging and dumping ranges.

Gas or diesel drive with simple gear arrangement eliminates thousands of wires and connections necessary in electrically powered machines. There's no need for cumbersome trailing cable; power loss through prime mover and D.C. generator is eliminated; entire shovel can be disassembled, moved and set up in several days instead of weeks.

Look into *all* of the 4500's outstanding advantages before investing in your next shovel or dragline. See why the speed, mobility, simplified design and versatility of these mighty mining machines are making news wherever they're in use. MANITOWOC ENGINEERING CORP., MANITOWOC, WIS.

THE LOHED MINE CAR
(end cover removed)

- cleaner dumping, greater strength with rounded corners
- greater durability, easier maintenance with simple rugged all welded construction

THE NEW FABRICATED SHEAVE

- reduces rope wear with anti-friction bearings and steel rim inserts
- less maintenance with quick changing rim inserts
- made of low carbon steel

THE "JETO" BOTTOM DUMP SKIP

- less dead load, greater pay load with light-weight aluminum and steel construction
- increased production with cleaner faster dumping action
- Lighter less expensive headframe construction due to greatly reduced headframe travel
- greater safety with positive dumping action and body safety latch

Engineered for the rugged demands of metal mining!

For close to 100 years Lake Shore has focused its seasoned engineering attention on developing equipment to make metal mining operations more efficient and safer. Excellent results of that continuous effort are the "Jeto" bottom dump skip, the new fabricated sheave, and the all welded "Lohed" mine car; useful developments that have achieved increased production, lower maintenance costs, and longer equipment life for the metal mining industry. Write for detailed product bulletins.

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Underground cars • skips • cages • trestle cars • sheaves
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MAXIMUM RECOVERY WITH HERCULES FLOTATION AGENTS

In the flotation of phosphate, feldspar, and mica, Hercules' Rosin Amine D Acetate has demonstrated its value as a highly efficient collector.

A cationic surface-active material, Rosin Amine D Acetate serves as an excellent collector for silica and silicate minerals as well as being useful in the beneficiation of nonmetallic ores.

A new addition to the Hercules family of flotation agents is Terposol® 50, a synthetic frother developed for general application in the flotation field. Now available in pilot plant quantities, Terposol 50 has displayed excellent frothing properties in the flotation of both sulfide and nonsulfide minerals.

For technical information on these and other Hercules' flotation agents, write:

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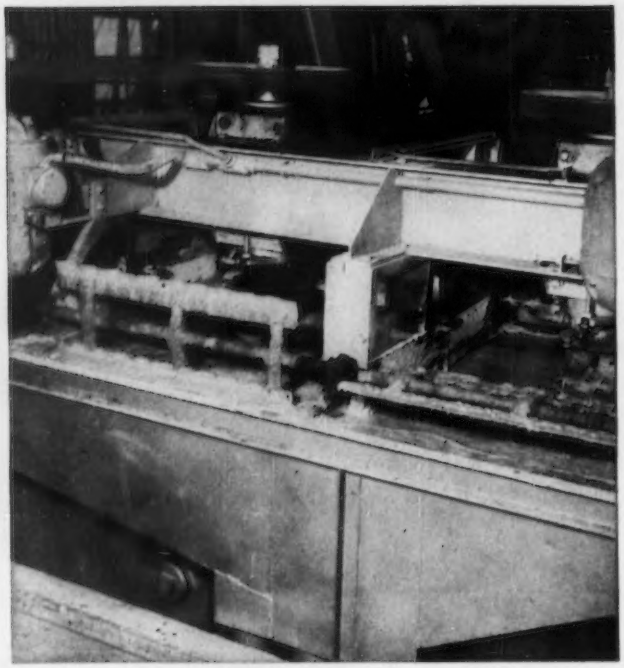
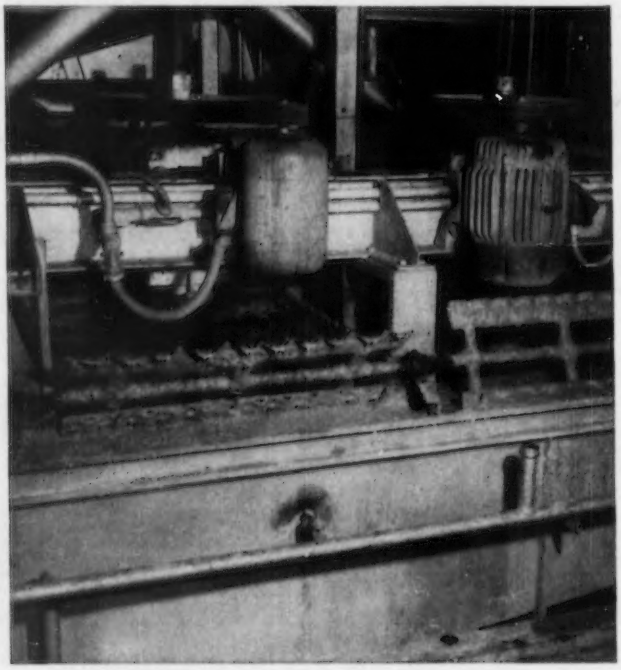
HERCULES
FLOTATION AGENTS



INITIAL STEP—Phosphate recovery begins in this large plant with a fatty acid flotation step whereby phosphate is separated from the sand.



SECOND STEP—Final purification follows during which most of the sand remaining in the initial phosphate concentrate is floated with rosin amine.

Austria *(Continued)*

BBU has supplied the Austrian market with lead since 1869, and also produced zinc ores from its mines. These agglomerated ores had to be shipped to Belgium, however, for processing, thus increasing the price of the product. Domestic market, demanding an average of 7,500 metric tons of zinc annually, can be supplied 100% from Arnoldstein.

In 1952 a roasting plant was built, where zinc metal is agglomerated. New plant now produces zinc metal at an annual rate of 11,000 metric tons. Metallurgical analysis is 58% zinc in the concentrate, 15% lead, and 27% sulphur. The electrolytic zinc purity is 99.99%, in 52-lb plates. Plant needs about 3800 kwh per metric ton of finished metal.

Zinc plant of Arnoldstein, including the roasting plant, agglomerated, and electrolytic plants, now employs 700. 50% of the investment sum was spent domestically, the rest abroad for machinery of special design; BBU's newest plant belongs to the nationalized part of the Austrian economy.

SPAIN

Provincial mining authority has authorized SA Minera Celdran of Cartagena to spend 300-million pesetas on a new modern concentration plant for treating 40,000 tons of blende annually. The new installations will include the latest flotation plant and two melting furnaces. Value of the imports required is calculated at 33-million presetas.

The new installation will greatly increase Spain's ability to export zinc in concentrate form instead of in the form of ore as at present. Yield from the blende is expected to be about 40-50 per cent.

IN ASIA

JAPAN

Indian-Portuguese dispute over Goa may halt the tiny colony's iron ore supplies to Japan and force down steel production.

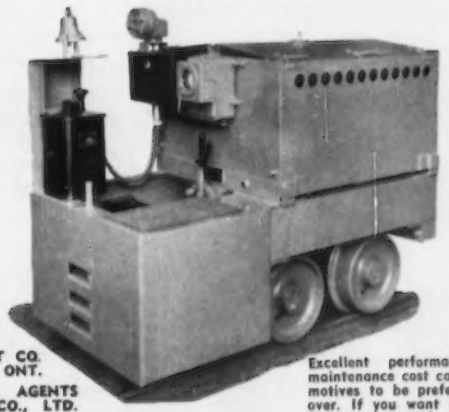
Japan is to buy 450,000 tons of iron ore from Portuguese-India during second half of this fiscal year, beginning in October.

However, eight Japanese shipping companies hauling ore from Goa to Japan have agreed to suspend their Goa service, in order to avoid irritating India. They have already cancelled their iron ore-hauling contracts with steel makers.

Japan now imports around 900,000 tons of iron ore yearly from Goa, but Japanese shipping companies, threatened with the loss of their Indian trade if they continue to call at Portuguese ports (in India), say they would rather shut down the operation.

Indian Government is considering the possibility of making good Japan's loss from her own available resources. Indian

SINCE 1896 *first* FOR SERVICE and ECONOMY



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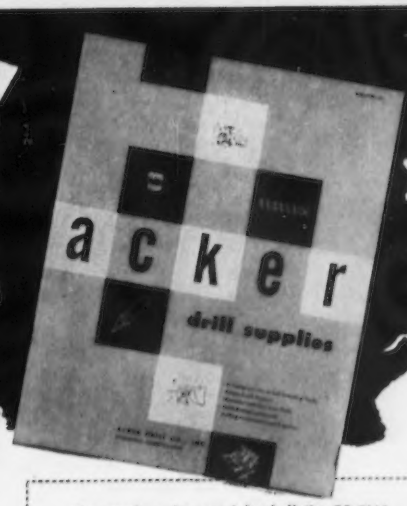

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PROOF OF LIMA QUALITY

J & L's Lima is shown unloading coils of hot strip steel outside a warehouse at the Cleveland Works . . . just one of the wide variety of materials handling jobs assigned to this rugged, versatile machine.

J&L Steel's Cleveland Works reports:

"We get dependable materials handling mobility with our fast-moving wagon mounted Lima"

"Our rugged, fast-moving wagon mounted Lima crane makes materials handling equipment available fast *where* we need it, *when* we need it—in every corner of our plant." That's the report from Jones & Laughlin Steel Corporation's Cleveland Works. They've had a quality-built Lima wagon mounted Type 34 working at yard materials handling assignments since 1950. J & L's Lima first spent several years loading limestone at their blast furnaces . . . 24 hours a day, seven days a week without breakdown. In 1953 the machine had its only overhaul. A generator was added, and the Lima was magnetized. Since then, it's been used—with hook or magnet—to load and unload rails, scrap, castings, coil steel from the hot strip mill, and a variety of receivable materials in every part of the plant.

J & L says: "We really benefit from our Lima's mobility. It works in locations that can't be reached with other types of equipment. We move it all over the plant, sometimes a distance of 4 miles from one working location to another. Naturally, rapid movement is essential, and our Lima can really be moved quickly from job to job. That makes it possible for us to get maximum service from the machine during its operating periods.

"Performance has been excellent for all general requirements within the Lima's capacity. Maintenance costs have been at a minimum during five years' service."

Why not let a Lima help to solve *your* materials handling problems. Let us give you full details on the complete line of wagon, truck and crawler mounted Limas . . . designed and built with the emphasis on quality to give *you* perfect performance on every job. See your nearby Lima distributor, or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

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STEARNS HIGH-INTENSITY MAGNETIC SEPARATOR

Stearns Type K magnetic separator provides an intensely powerful magnetic field which attracts very feebly magnetic particles. That is why the "K" has proved highly successful in purifying and concentrating minerals when other methods were either impractical or inadequate.

Users report that this separator has given outstanding results for magnetically cleaning or concentrating materials ranging in size from 10 to 200 mesh. Capacity ranges from 80 to over 500 lb per hr per inch of feed width. "K" separators are built in 10, 20 and 30-in. feed widths and can be furnished with from 2 to 7 magnetic fields. Complete laboratory facilities available for testing samples of your product. We invite comparison of results. Write today for bulletin 701B.

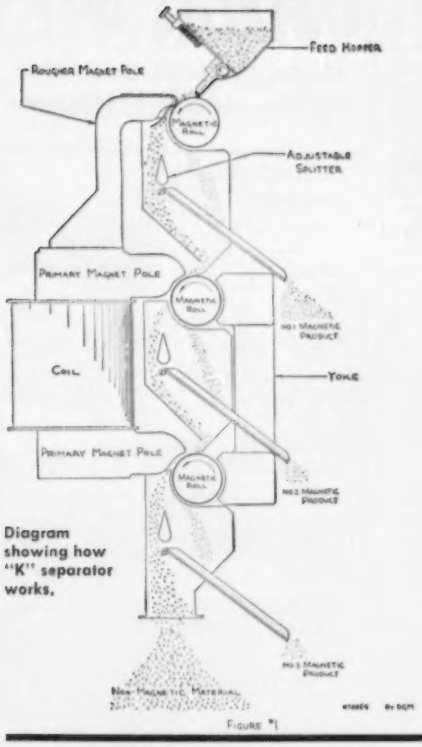


Diagram showing how "K" separator works.

FIGURE "1

FEATURES THAT PUT THE "K" OUT FRONT:

1. Magnetic field protected against flux leakage
Magnet support frame is not part of magnetic circuit. Specially constructed steel rolls with non-magnetic stub shafts further insulate magnetic circuit.

2. Simple adjustment
Positive, easy control of feed rate, air gap width, splitter settings for extremely accurate separation. So simple, unskilled workers can operate and adjust it.

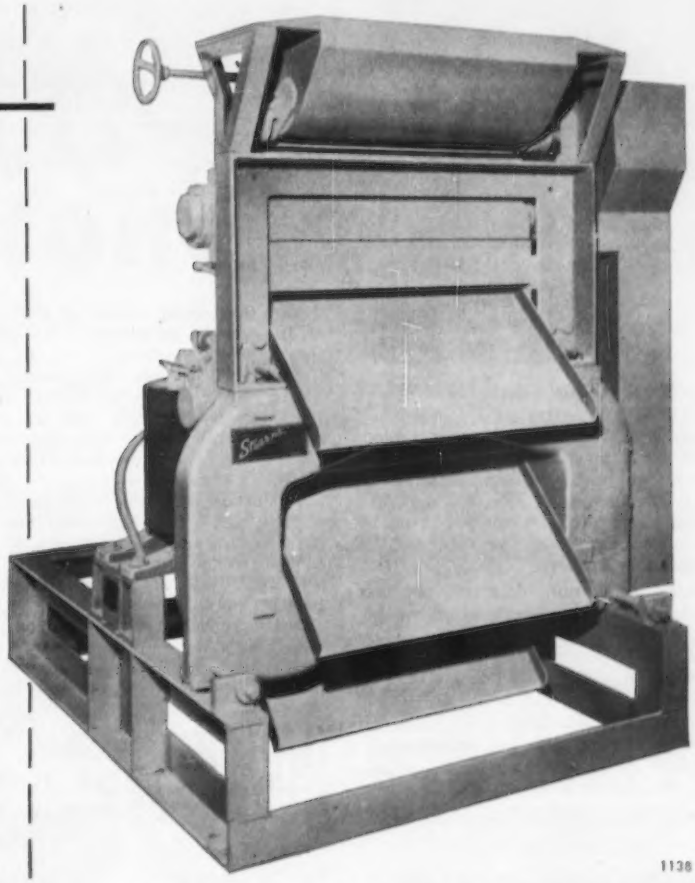
3. Uniform material distribution
Louver-type feeder provides uniform distribution across entire feeder width. Speed of feed closely matches roller speed for greatest efficiency.

4. Powerful magnetic force
Primary pole noses are scientifically shaped to give maximum flux density in separating zone—take full advantage of powerful electro-magnetic force.

5. Dependable, long-lasting
Triple-sealed bearings keep out dust, insure smooth, low-cost operation. All parts are easily accessible for service.

Here are some products the "K" handled profitably:

Product Purification	
Silica Sand	Nefheline Syenite
Scheelite	Barite
Soda Ash	**Product Concentration**
Abrasives	Manganese Minerals
Silicon Carbide	Ilmenite
Aluminum Oxide	Monazite
Pottery Clay	Chromite
Fire Clay	Columbium Ores
Kyanite	Tantalium
	Wolframite



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STEARNS MAGNETIC, INC., 624 S. 28th St., Milwaukee 46, Wis.

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• Used for repair of all types of damaged spots, edge wear and for covering metallic joints. Available in introductory kits or parts separately.

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REMA SELF-VULCANIZING RUBBER REPAIR MATERIALS

Japan *(Continued)*

Minister for Commerce and Industry told Parliament that the country had such large reserves of this basic material that she could go on exporting for 100 years and still meet all the needs of her expanding Iron and Steel industry.

Sumitomo Metal Mining Co. is planning to resume operation of a nickel mine in Colaca, southern Celebes Island, suspended since the war. Sumitomo will dispatch technicians to the South Sea island to make an on-the-spot survey of the mine which they operated before the war.

An agreement to develop the mine jointly with the present owner, Tradja Mining Co., was reached when the latter's president visited Japan last spring. Japanese and Celebes companies, according to the agreement, will develop mine jointly with funds and technique furnished by the former.

Nickel ore from the mine will be exported to Japan. Sumitomo will purchase more than 50,000 tons of present ore stocks from the Celebes firm and restore the old mining facilities. Mine is estimated to have 3-million tons of 3% ore.

RUSSIA

Russia is using a fleet of MI-4 helicopters to make extensive geological surveys in western Siberia, according to the Moscow newspaper Trud. Center of the aerial exploration activity is along the middle reaches of the Ob river.

CEYLON

During the second quarter of 1955 one dredge resumed tin mining, but 9 gravel pump mines shut down.

The price of tin rose during the quarter to an average of $361.13 ($US 117) per picul (133⅓ lbs) in June. Average price for the first six months was $9 higher than the first six months of 1954.

Production for the first six months is slightly higher than for 1954, but the second quarter shows a decrease of 1% and it seems likely that total 1955 production will be slightly less than 1954's.

Asian production has increased by 10% over 1954, while European production has decreased by 3%.

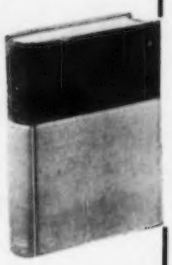
IN THE NEAR EAST

TURKEY

A new Turkish company has been formed by the Sumer and Eti Banks and other State organizations to exploit the copper containing pirites mine at Asiköy. Capital of the new company is LT 1,250,000.

CHECKLIST OF McGRAW-HILL books for YOUR professional library

☐ **MINERALS IN WORLD INDUSTRY**



Presents a comprehensive survey of minerals and their importance to production and productivity—as a basis of world industrial development, as a major factor in developing America's high standard of living, and as a cause of international competition. **By Walter H. Voskuil, Chief Mineral Economist, Ill. State Geological Survey. 324 pp., 24 maps, 57 tables, $5.75**

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Shows how nuclear research can be applied to geology and related fields. Includes data on the physics and chemistry of nuclides, their occurrence in Nature, and research methods of isotope geology. **By Kalervo Rankama, Research Prof. of Mineral Chem., Univ. of Helsinki. 535 pp., 43 illus., 70 tables, $12.00**

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Gives in detail effective systematic appraisal procedures and techniques to follow in finding the value of industrial, commercial, utility, and natural-resource property. **By Anson Marston, Iowa State Coll.; Robley Winfrey, Iowa State Coll.; and Major J. C. Hempstead, U. S. A. F. Academy. 2nd Ed. 486 pp.; 31 illus., 74 tables, $8.00**

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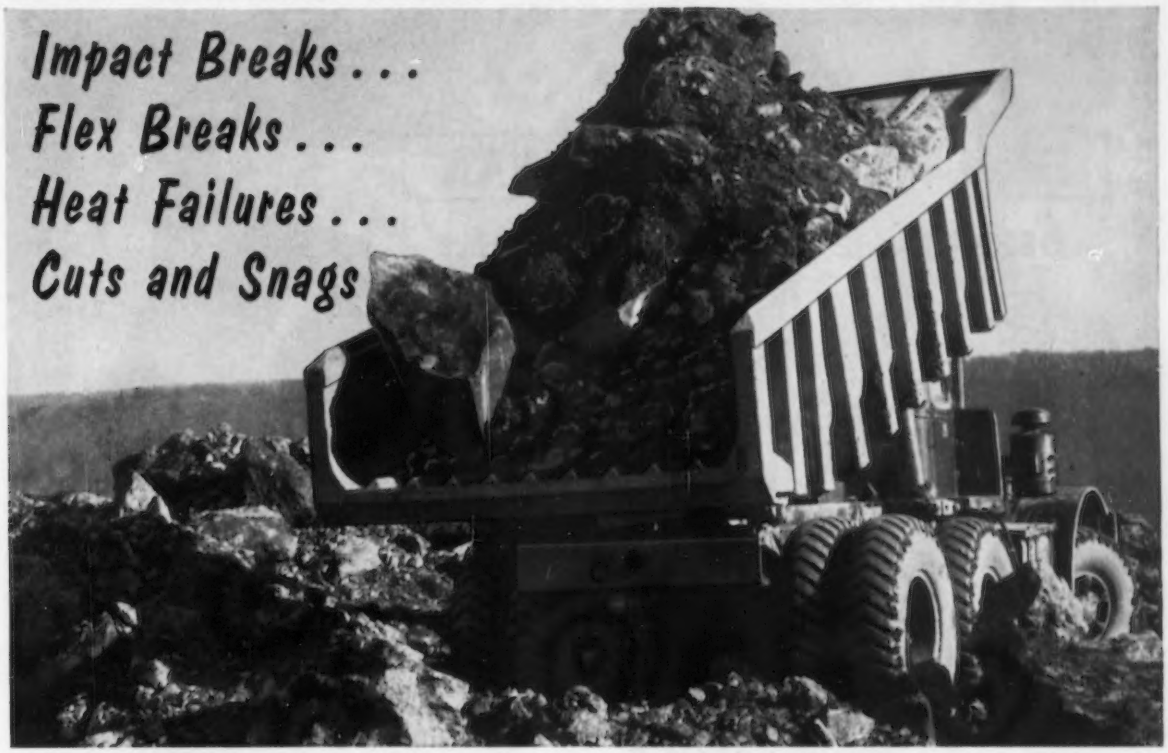

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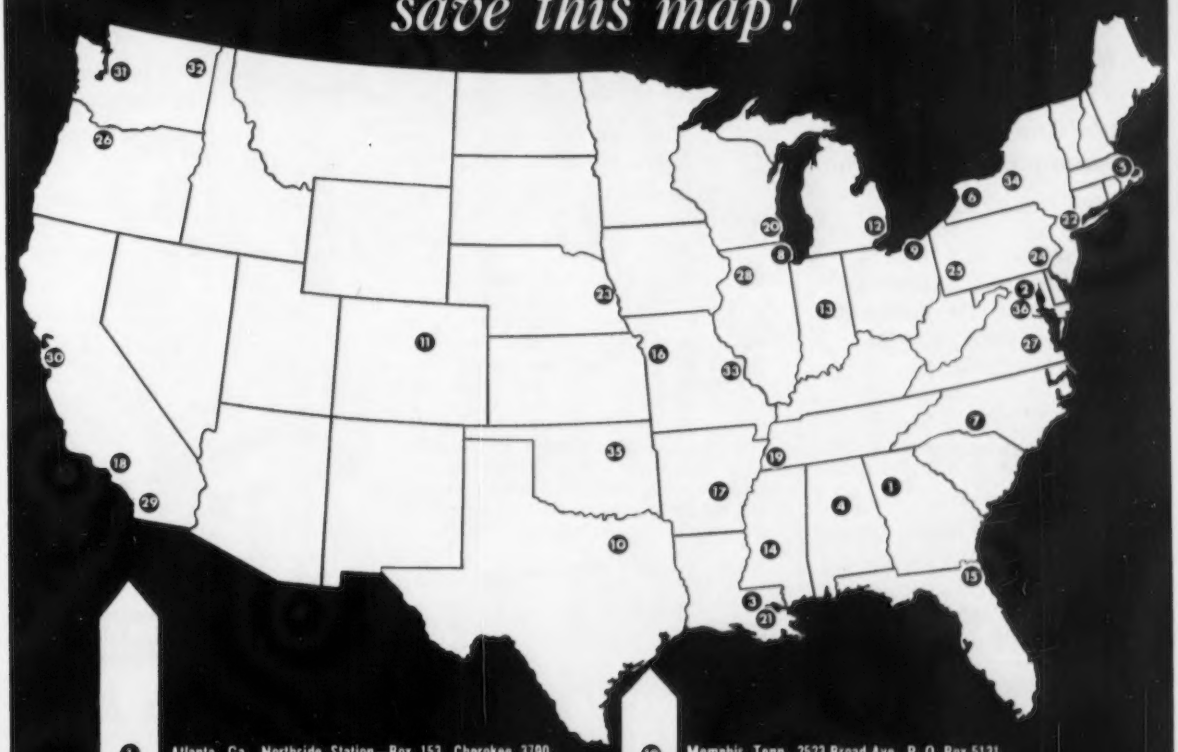

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Yes, weigh and record with the —MERRICK

WEIGHTOMETER

The Merrick Weightometer provides a continuous, automatic, accurate weight record at any designated point in the mill, while material is in motion on conveyor. It weighs without interrupting conveyor service. Applicable to any size belt conveyor, horizontal or inclined. An accurate and dependable means of keeping constant check on production.

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Turkey (*Continued*)

During the first four months of the current year coal production has been maintained at slightly above the 1954 monthly average of 475,913 metric tons. Production of sulphur during January to April, 1955, averaged 955 metric tons as against a monthly average of 835 tons for the whole of 1954.

Copper (smelter) production averaged 1,707 metric tons, a considerable reduction on the 1954 monthly average of 2,099 tons; in April 1955 only 1,211 tons were produced, as against 2,248 tons a year earlier.

In 1954 the average monthly production of lignite was 173,881 tons, of chrome 43,636 tons, of iron 39,769 tons and manganese 3,922 tons. 1954 figures for coal, lignite, copper and sulphur were the highest ever recorded but chrome and manganese production fell considerably below the previous year's records of 76,043 tons and 7,487 tons monthly respectively, while iron production was 1,654 tons below the 1953 average.

In 1954, 582 prospecting licenses, 46 exploration permits and 2 exploration certificates were issued. Outstanding development was the discovery of uranium and wolfram deposits. Production figures for the year were as follows:

1954 Production

	Tons
Antimony	1,783
Copper	25,194
Boracite	14,331
Lead	2,493
Iron	586,205
Chrome	540,049
Sulphur	9,995
Lignite	2,095,379
Meerschaum (crates)	776
Manganese	49,813
Magnesite	1,065
Coal	5,714,119
Emery	4,802
Wolfram	250

1954 Exports

	Tons
Iron ore	170,701
Scrap iron	2,265
Iron shavings	589
Copper ore	15,103
Lead ore	1,400
Lead mixed with zinc	....
Zinc ore	220
Antimony	1,950
Chrome	357,476
Manganese	40,237
Boracite	17,482
Coal	....
Meerschaum	22
Emery	8,593

EGYPT

A Yugoslav firm "Yugometal" will purchase 20,000 tons of phosphate from the Jordanian Phosphate Co. Jordanian has called a Belgian expert to study the possibility of commercially working the phosphorus rich Hasa area in southern Jordan. 159,000 tons of phosphorus have been exported in 1955 so far. Output is expected to reach 250,000 tons.

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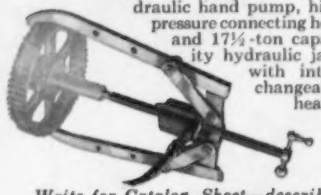
Valuable Maintenance Tool

With the handy portable HYDRAGRIP and a few ARMSTRONG-BRAY Pullers, you can quickly, safely and easily remove gears, wheels, bearings, sheaves or parts from shafts, can re-install them with equal ease. Single centered ram assures aligned thrust that moves parts along shafts smoothly without wedging or binding. Saves time, saves parts—ends battering and breakage. The HYDRAGRIP—comes complete with handy, portable, hydraulic hand pump, high pressure connecting hose and 17½-ton capacity hydraulic jack with interchangeable heads.



Write for Catalog Sheet—describes HYDRAGRIP and complete line of standard and special external and internal pullers.

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5322 NORTHWEST HIGHWAY • CHICAGO 30, ILL

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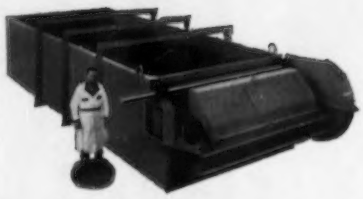

EAGLE 48"
LOG WASHER

A heavy duty money maker that will economically abrade and scrub ore, crushed stone or gravel . . . year after year.
Handles material up to 8" in diameter . . . capacity to 150 tons per hour (depending upon material size and amount of foreign matter to be removed). Tub is 9'4" wide x 24' or 30' long. Both logs are 48" dia. Sturdy Tubular log shaft . . . no deflection. Enclosed gearing at discharge end as shown.

Send for Catalog 55.

EAGLE IRON WORKS
262 HOLCOMB AVE. DES MOINES, IOWA

Breaker Bails, Pile Hammers, and Line Weights.

NEW SUPER RAYNILE CONVEYOR BELT 400% STRONGER

Provides the economical answer to transporting ore and other bulk materials over long distances and up steep slopes.

This remarkable new Hewitt-Robins conveyor belt reinforced with the revolutionary synthetic fabric, Super Raynile, makes possible an entirely new concept in single-section conveyor application. It solves difficult materials handling problems where topography and other conditions require the use of a long single-length conveyor.

Already in service, Super Raynile has the highest operating tension of any conventional carcass belt. Because of its tremendous tensile strength, 400% greater than conventional cotton reinforced belts, a single conveyor section *5¾ miles long* can be built over level terrain to carry material at 400 TPH using only a 6-ply Super Raynile belt 30 inches wide. This same belt can also lift material from ground level to a height of 830 feet.

The new Hewitt-Robins Super Raynile conveyor belt is highly flexible and pliable despite its great strength. Its cost is less than steel-reinforced belts and Super Raynile can easily be spliced in the field more quickly, more economically and without the specialized equipment required to splice steel-reinforced belts.

Super Raynile belt is available in a wide range of specifications . . . widths up to 72" — thickness up to 15 plies.

Learn more about this new long-length, long-life conveyor belt. Contact your local Hewitt-Robins Industrial Supply Distributor (see Classified Phone Book), or write direct to "Super Raynile Belt", Hewitt-Robins Incorporated, Stamford, Connecticut.

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Conveyor Belting—Industrial Hose—Conveyor Machinery—Vibrating Screens—Vibrating Conveyors—Design, Manufacture, Engineering and Erection of Complete Bulk Materials Handling Systems.

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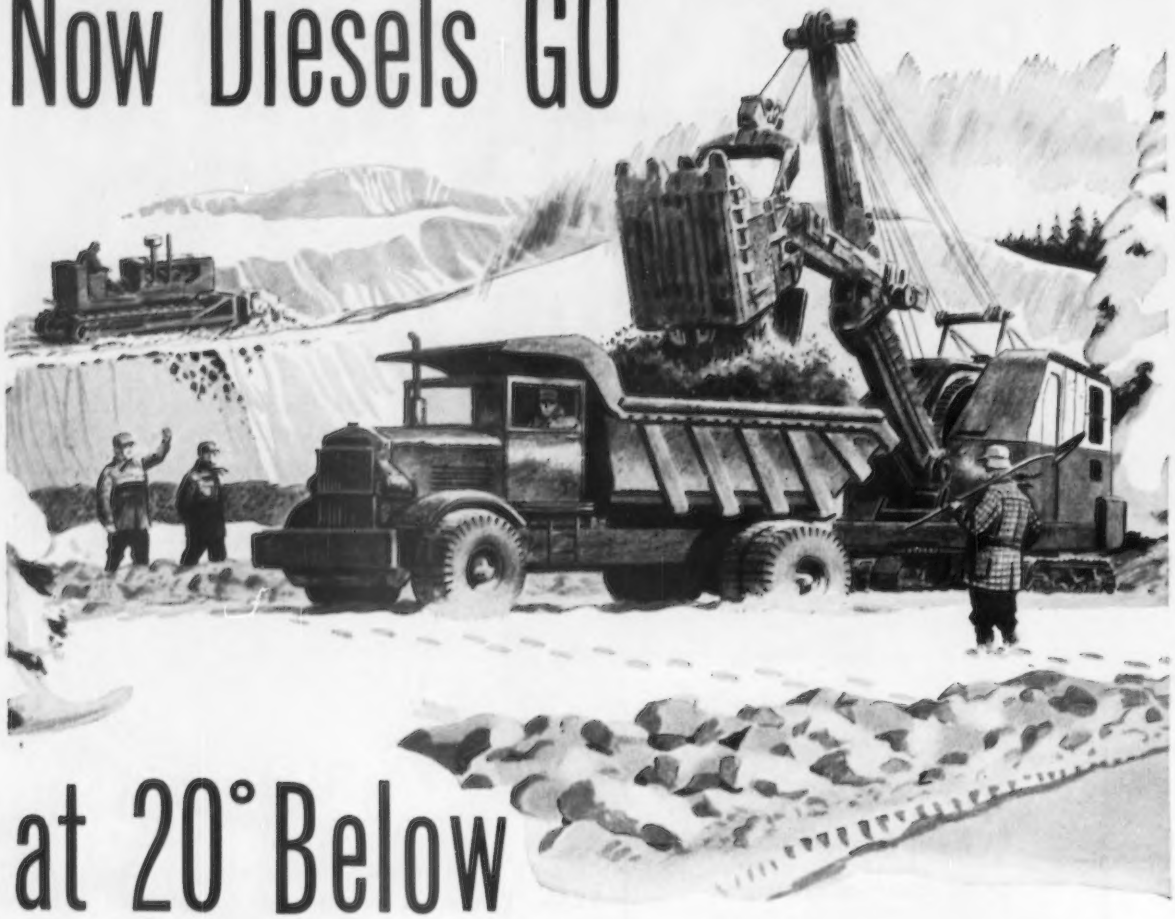
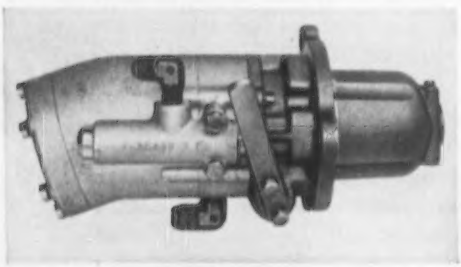
Now Diesels GO



at 20° Below

New Hydrostarter Spins Engines Faster



Heart of the Aeroproducts Hydrostarter is this hydraulic starting motor which spins a Diesel twice as fast as battery-operated starters.

Now, before winter sets in with a vengeance, is the time to put a new, low-cost Aeroproducts Hydrostarter on your Diesel.

Even at 20° below zero, this hydraulic starting system gives you quick, sure starts on every Diesel up to 300 horsepower no matter how long your equipment has been standing idle. The motor delivers maximum torque at all temperatures to overcome starting inertia.

It replaces conventional starting systems, frees you from many maintenance problems and costs less to operate.

And it sells for a far lower price than any other nonelectric Diesel starter available today.

Your Diesel engine or equipment dealer can install an Aeroproducts Hydrostarter on your Diesel in just a few hours' time. He can give you full information—or quickly get it for you. See him today or write direct for full details.

General Motors engineering leads the way

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Building for today...Designing for tomorrow

Aeroproducts

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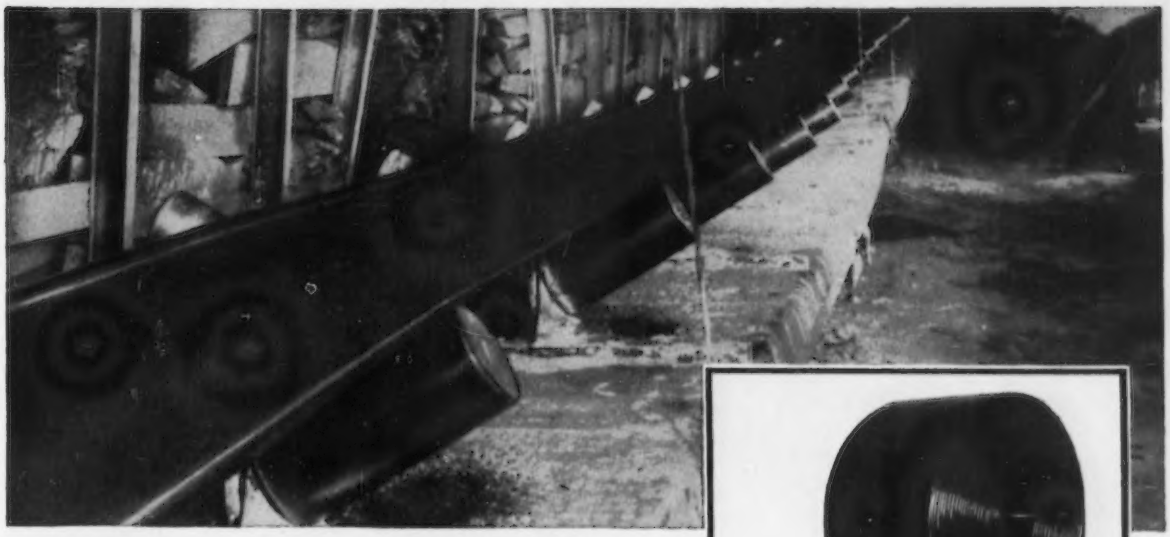

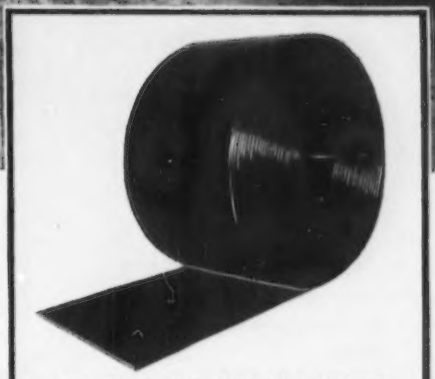

Inset shows roll of SCANDURA. Photo at left shows Face Conveyor in coal mine.

SCANDURA

the original P. V. C. fireproof

MINE Conveyor BELTING

One of the great hazards of mining—fire caused by a belt stalled over a still-rotating driving drum—is eliminated by new SCANDURA BELTING . . . . the original P. V. C. Conveyor belt which was developed in the United Kingdom and now manufactured by us in our Charlotte, N. C. plant.

Other unique SCANDURA features:

- *Its resistance to abrasion is superior.*
- *Fastener holding qualities are unusually good.*
- *The coating will not separate from the belt and will not rip or "dog-ear".*
- *The Solid Woven construction greatly reduces the possibility of mechanical damage.*
- *Stretch is not excessive.*
- *Works in temperatures ranging from 10° below to 212° above.*
- *IT IS NON-INFLAMMABLE—the ROT-PROOF Treatment protects body of the belt from mildew.*

SCANDURA has been tested and used with gratifying results in Britain since 1946 and is now being installed in American Coal Mines. For safety and economy, *it's in a class by itself.*

Exclusive Distributors *For the Mining Industry East of the Mississippi*

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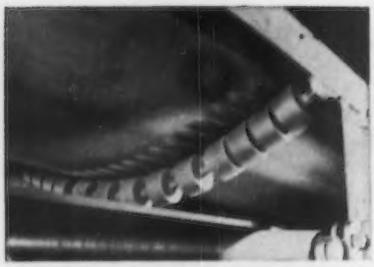


NEW CONVEYOR BELT IDLER

Handles sticky, abrasive, dusty, or corrosive materials.
Has only two bearings—up out of the dirt.

A 2-bearing, cable suspension idler that resists dust, abrasion, corrosion and material buildup is proving itself superior for bulk handling in many industries.

Called the Limberoller, it has already given *10 times* the service life of replaced steel idlers in handling abrasive foundry sands, coal, petroleum coke, potash, copper ores, copper mill tailings, iron ore, wet concrete, triple super phosphate, ammonium sulphate, and sticky fertilizers.

Pressure-molded neoprene or rubber discs on a flexible steel cable conform to load and cushion the belt, help keep belt aligned, and are self-cleaning. The two bearings are up out of the dirt zone; have had no design failures.

Unaffected by most corrosives that damage steel, the new idler is ideal for chemical, sulphur and salt plants; corrosive and high ozone atmospheres. It is more abrasive-resistant than steel and flexes out of the way of abrasive materials.

The Limberoller weighs 2/3 less than a conventional steel idler; is locked by a simple cotter key into special lightweight stands for easy installation and removal. No cover sheets are needed. Two types of stands are available: one that bolts to conventional rigid sections; and a self-supporting type that forms its own easily-erected, portable sections without bolts, by using special stiffening rails.

Because of these unique features, many companies have adopted Limberollers as standard for all belt conveyor operations. Details from *Joy Mfg. Co., Oliver Bldg., Pittsburgh 22, Pa. Request Bulletin 11-4.*

AMC Convention

(Continued from p 103)

plete cycle is completed in one shift by 3 men. Advance is 7.4 ft, the men cleaning out the round blasted on the previous shift and drilling and blasting the next round, using 3 drills. As mine operates on a 2-shift per day basis, a daily advance of 14.8 ft is made compared to the 8½ ft by drifter method.

R. F. Moe described the experimental rotary drilling in sandstone and shale in the White Pine Copper mine in Michigan and development of a 2-boom rotary drill jumbo. The work was undertaken after successful use of an 8-in. auger drill in the three 8 x 24-ft. main entries into the orebody. Bit tests are being run, using a thrust range of 3000 to 8000 psi and a rotation range from 100 to 600 rpm. Best penetration performance according to tests is when drill is operating at 300 rpm and 5500 lb thrust. Average life of a 1¾-in. two- or three-prong bit is 400 ft.

Drilling and blasting practices at the Bell Mine of Warner Co., Bellefonte, Pa., were discussed by H. A. Corre. Rotary blasthole drilling in large shrinkage stopes is done with diamond bits, using a horizontal fan pattern with holes 150 ft long. A vertical fan pattern is used in sublevels with 125-ft intervals. Footage has increased from 3900 ft per bit to 5590 ft, and change in diamond bit cost per ton from $0.0065 to $0.0022.

Steel Arch Service

Yieldable steel arches for roof support are giving excellent service in haulage and slusher drifts in the iron mine of Bethlehem Cornwall Corp. at Cornwall, Pa., according to R. W. Sleeman. Installation cost is only slightly higher than concrete lining. R. C. Nispel stated that if the experiment with yieldable steel arches in the Minnesota Hi orebody at Ruth, Nev., proves satisfactory, a complete change in mining plans from branch raises to slusher drift is anticipated in the Deep Ruth block-carrying project.

Discussing improved mining methods and equipment, Roger V. Pierce showed by slides and film the operation of the Cryderman shaft mucker designed for use in vertical and inclined shafts; the Zeni hydraulically-controlled rotary drill now drilling its third 6-ft diameter hole for main mine shaft service; and San Francisco Chemical's multiple train car loader for drift work that allows the full 50-ton broken round to be mucked into cars without snitching a single car, as used in the company's phosphate mine in southeastern Idaho.

PHIL MERRITT: "Uranium exploration has to move ahead. . .to keep present and future mills going."

Underground progress made and new loading, drilling, transportation, belt conveyor equipment, and continuous miners placed in operation during the past year by the five potash mining companies active in the Carlsbad, N.M., area, and current surface plant construction carried out by National Potash Co. and Farm Chemical Resource Development Corp., newcomers in the field, were pictorially described by E. H. Miller.

A paper by C. A. Romano and R. F. Love using slides described trackless mining of trona at the property of Intermountain Chemical Corp., Green River, Wyo. Coal mining equipment modified to handle the harder trona is employed. Wide use is made of roof bolts in chambers, some 80,000 units being placed per year. About 100 are placed per day on 4-ft centers by truck-mounted stopers. Conveyor belts are suspended from roof bolt. Swelling ground (floor is top of high-grade oil shale bed) makes conventional installation impracticable because of frequent realinement required.

V. D. O'Leary explained in detail the new horizontal cut-and-fill stoping method used in the Mountain Con mine of Anaconda Co. at Butte, Mont. Use of rock bolts has cut all excavation necessary in the past for required sill advance about one-third, and has practically eliminated the use of timber. To work ground fast, the prerequisite for untimbered Mountain Con ore, long rounds, millisecond blasting and an overhauled scraping method were put into effect. Total cost decrease brought about by the new method, including recent wage increases, is 12.3%. Smelter tailings are used for fill.

Session closed with a description

TAPER-LOCK

A PATENTED PRODUCT OF DODGE

—OFF THE SHELF

NO REBORING!
NO KEYSEATING!
NO MACHINING!

Ready for the shaft, with no costly, time-consuming operations to make them fit. That's the big news about Dodge Taper-Lock Sprockets. Taper-Lock grips the shaft with the firmness of a shrunk-on fit, yet comes off easily. Bushings may be re-used. They come in sizes to meet most every application.

Taper-Lock Sprockets are available from Distributors' stocks in a complete range of B-type steel sprockets —½" to 2" pitch. Dodge quality Roller Chain is packaged in 10-foot lengths—also available in 50-foot and 100-foot reels. Save time—save money—keep production rolling—get Dodge Taper-Lock Sprockets and Roller Chain from your Dodge Distributor.

DODGE MANUFACTURING CORPORATION, 3100 Union St., Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor, for valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.

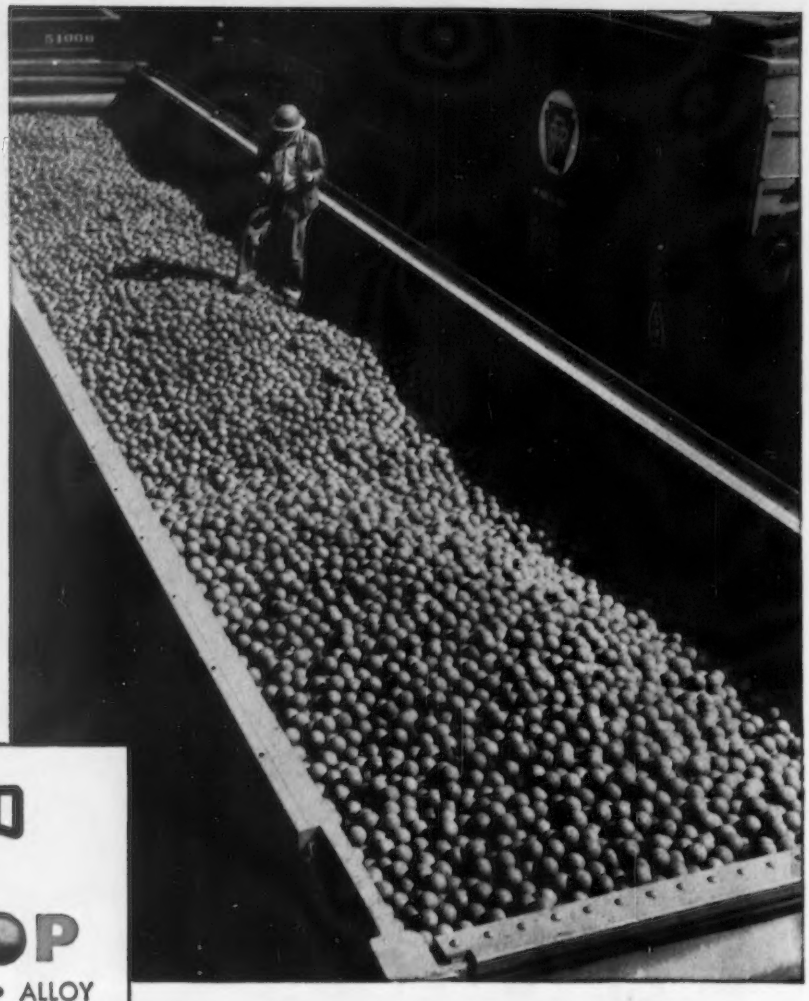
THERE'S ONLY ONE TAPER-LOCK, THE BUSHING THAT MOUNTS FLUSH!

Standardize, economize with Taper-Lock, the bushing that is interchangeable in Dodge sprockets; sheaves, couplings and conveyor pulleys. *More than 2,000,000 in use!*

DODGE

of Mishawaka, Ind.

Ready to Roll for a Longer Grind



SHEFFIELD
ARMCO

MOLY-COP
TRADE MARK
COPPER • MOLYBDENUM • ALLOY
GRINDING BALLS

This carload of Moly-Cop Grinding Balls might be headed to any one of hundreds of destinations around the world. Sheffield ships them everywhere grinding is part of the industrial picture.

Wherever they go, they'll do a better grinding job. Fewer chargings will be required. Less down time. Less frequent freight bills. Money saved.

That's because Moly-Cop Grinding Balls keep their spherical shape longer. Sheffield's special alloy of steel, copper and molybdenum is just the right "recipe" for longest resistance to wear, chipping and abrasion. There's a big difference in grinding balls—and it will show up on your profit sheet when you use Moly-Cop Grinding Balls.

We're ready with the best grinding ball—plus engineering counsel on how it can best save money in your operation. A call will get you all the facts.

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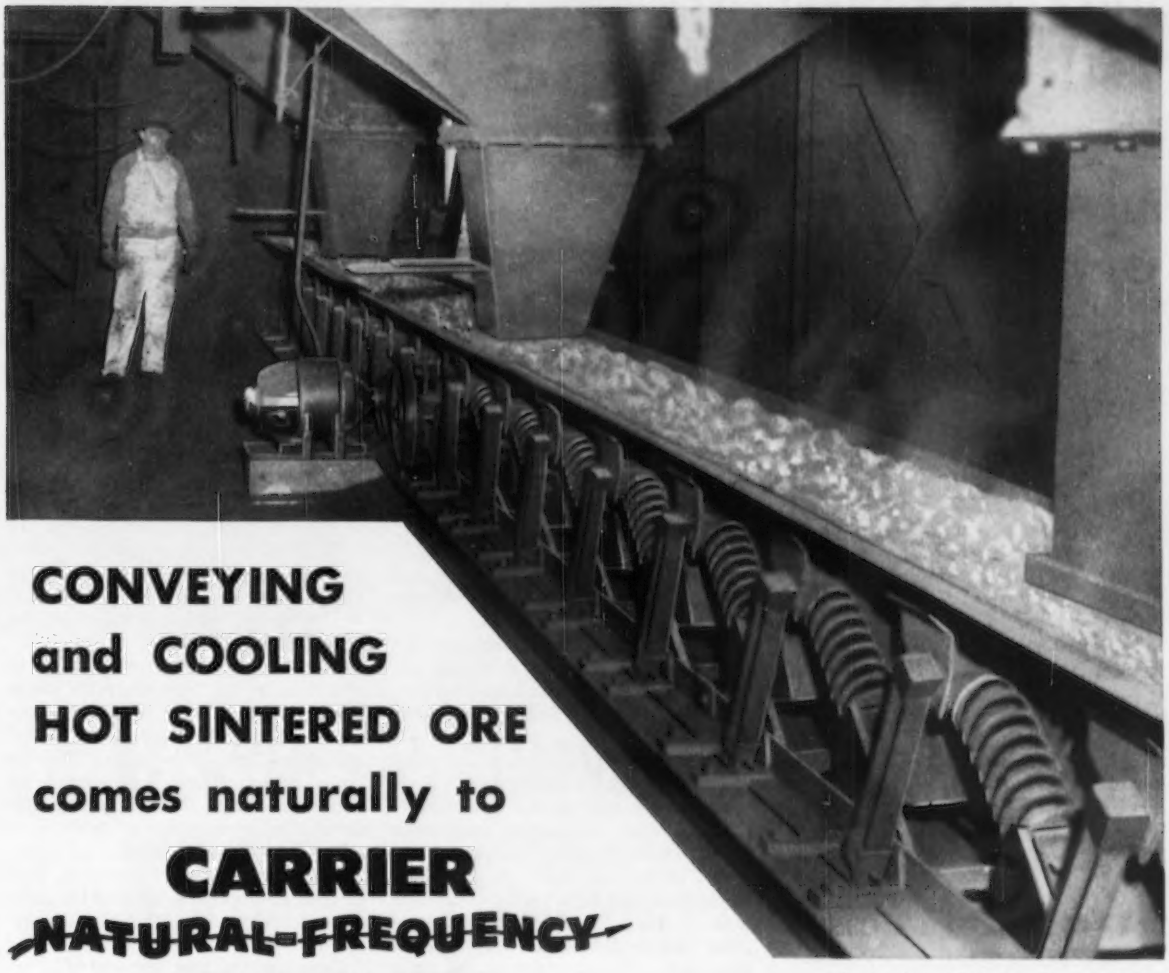

CONVEYING and COOLING HOT SINTERED ORE comes naturally to CARRIER ~~NATURAL-FREQUENCY~~ CONVEYORS

Carrier Natural-Frequency Conveyor in Alan Wood Steel Co. plant, Conshohocken, Pa.

Conveying and cooling up to 40 tons of hot sintered ore an hour is a "natural" for Carrier Natural-Frequency Conveyors. The 57-foot unit in Alan Wood Steel Company's Conshohocken plant, above, is powered by one 7½ H.P. drive and has a one-piece steel-plate pan, ½" thick. It receives the 700° (F.) ore from hoppers, then quickly vibrates it to storage with a gentle, abrasion-free motion. The conveying speed is 90′ per minute.

Notice that no water jackets are required for cooling—the conveyor's spring hangers have air-gap insulation spaces that not only cool the pan and ore, but also eliminate the possibility of corrosion and leakage!

And because of exclusive Natural-Frequency design, there's an absolute minimum of maintenance and down-time!

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on the
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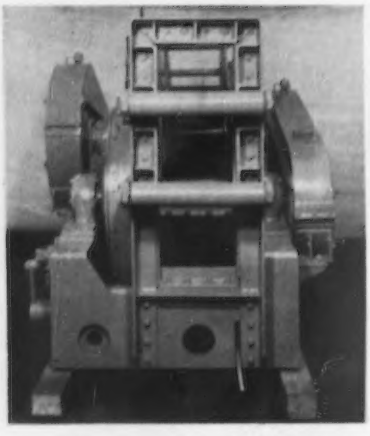

125 h.p. Vulcan-Denver remote control tandem slusher for trench work, which is now in use on the Upper Peninsula.

WRITE FOR
NEW CATALOG
ON
VULCAN-DENVER
ELECTRIC SLUSHERS

Vulcan Denver

VULCAN IRON
WORKS COMPANY
1423 STOUT ST., DENVER, COLORADO

AMC *(Continued)*

by J. C. Kinnear, Jr., of the grouting operations completed recently in the flooded Deep Ruth and Kellinske Shafts at Ruth, Nev. The Ruth shaft was flooded out by a 10,000-gpm flow at 525 ft from the collar. Flow was stopped by concrete plug, followed by grouting. Latter was done in highly fractured and unconsolidated ground, requiring great skill, considerable time, and substantial cost. Grouting in the Deep Ruth shaft involved an expenditure of $650,000 and in the Kellinske shaft some $175,000.

Advantages in open pit mining obtained since selection or 12-in churn drill holes at the pit of Chino Mines division of Kennecott Copper Corp., Santa Rita, N.M., include a 33% saving in the amount of churn drill footage required to blast down benches varying in height from 42 to 50 ft; more rapid loading of holes; reduced track work; and better fragmentation; according to G. T. Ballmer and K. V. N. Harris.

H. B. Lee discussed development of a 50-yd dry rotary drill and use of Akremite at Maumee Collieries Co., Terre Haute, Ind. See *E&MJ*, May 1955, p 96.

During the discussion on company vs contract truck haulage, J. W. Wells spoke on the role played by contractors in open operations and some special services and equipment reserves offered by them. E. L. Joppa stated that only 10% of the 70-million tons of ore and 216-million tons of other materials mined during 1953 were moved by contractors. He cited inexperience in moving glacial muskeg, inability to cope successfully with water problems, inability to build and maintain good roads, and unfamiliarity with the severe winter weather in the area as chief factors of the contractor's failure to make a profit at first try.

Companies have found the contractor helpful in mining of small confined mineral areas, development and mining of small pits, and during emergencies. W. J. O'Connor disclosed that increased ore reserves now available because of higher price for copper, and write-off of cost of equipment have put Consolidated Coppermines back into mining. Development and mining of pits at Kimberly, Nev., after shutdown of underground mine was done satisfactorily by contractor.

Planning a radio system for profit was discussed by J. G. Ivy. He explained design, operation and purpose of system in operation at the Bartow phosphate mines and mills of International Minerals & Chemical Corp. The system was started with 14 mobile units in 1950, and today 35 units are in operation. He pointed out that the number of frequencies currently available for use by the mining industry are inadequate and urged that FCC and other Government agencies be informed of this fact.

CHARLES R. INCE stressed the need "for research and promotion" to expand the base metals market.

Radio communication system in operation in the New Cornelia pit of Phelps Dodge Corp., Ajo, Ariz., was explained by J. A. Lentz. Some 75,000 tpd are currently moved with 13 mine levels active. Radio has proved an important factor in maintaining efficiencies by saving time of supervisors and employees and through reduction of delays to operating equipment. Two central stations and 45 mobile units are currently in operation. Two transmitting frequencies are used.

Development and growth of Anaconda's New Mexico uranium operations shown by slides, with explanatory remarks by J. B. Knaebel, Manager, concluded the session.

The "AEC Policies: Outlook for the Industry" session, attended by a capacity crowd of uranium operators, proved less explosive than anticipated. Principal speaker was Sen. Clinton P. Anderson, (D.N.M.). He predicted a bright future for the uranium industry, pointing out diverse military needs, and growing demands on the part of industry. A similar view was expressed by W. M. Canaday, who attended the recent Geneva Conference.

R. G. Sullivan, Hon. Stephen L. R. McNicholls, Lieutenant Governor of Colorado, G. R. Kennedy, and B. B. Brewster discussed the outlook for uranium development and production. Most agreed that current boom is on the wane and that consolidations and mergers will result in 50 to 60 strong companies by 1956. Extension or buying program is needed to insure growth. Discoveries of new ore on Colorado Plateau were said to be ample to feed 18 to 20 mills.

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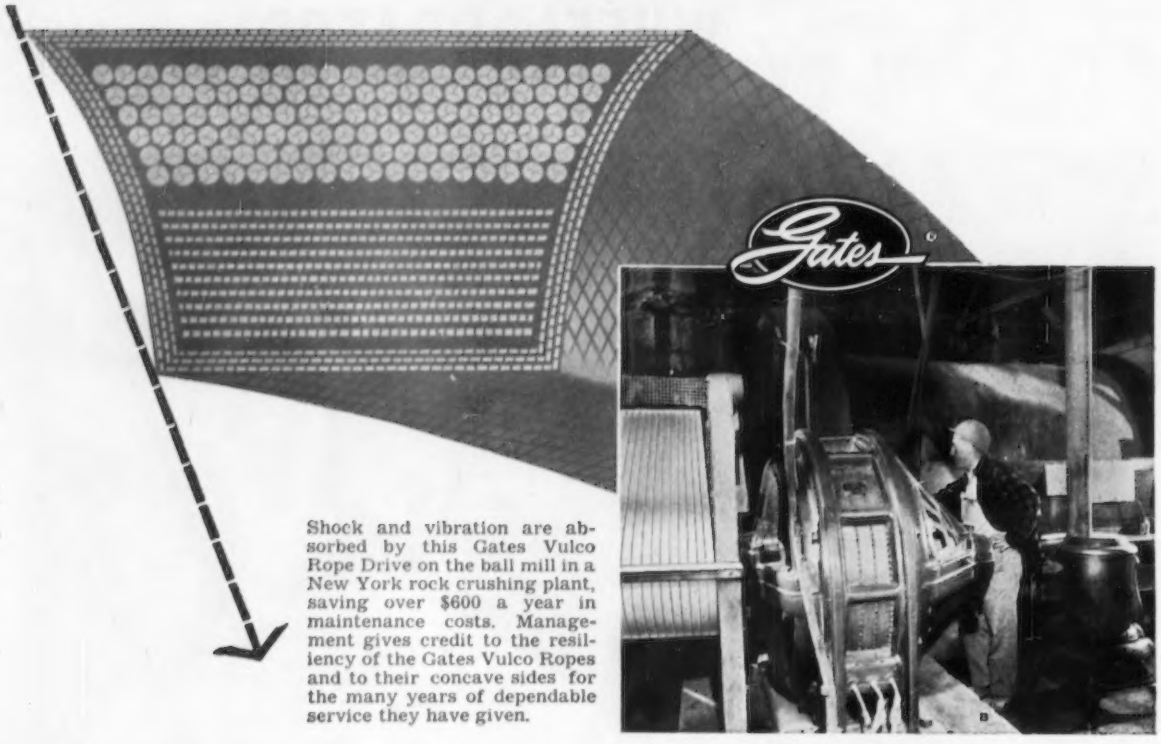

Shock and vibration are absorbed by this Gates Vulco Rope Drive on the ball mill in a New York rock crushing plant, saving over $600 a year in maintenance costs. Management gives credit to the resiliency of the Gates Vulco Ropes and to their concave sides for the many years of dependable service they have given.

Concave sides keep belt costs down!

Industry is saving thousands and thousands of dollars every year by specifying Gates Vulco Ropes—the V-Belts with *concave sides* (U.S. Pat. No. 1813698).

Here's the interesting reason *why* Gates belts save money:

On the bend around the sheave the *precisely engineered* concave sides (Fig. 1) of the Gates belt fill out and become straight (Fig. 1-A). Thus the belt makes uniform contact with the sides of the pulley. That means sure pulling power and *even distribution of wear*. Longer wear, fewer replacements cut belt costs...reduce down time...contribute to profits.

Simple test proves value of concave sides

Bend a straight-sided belt (Fig. 2) and feel the sides *bulge out* around the bend. The bulging sides prevent the belt from fitting evenly in the pulley groove (Fig. 2-A). Uneven contact causes uneven wear...shortens belt life...increases costs.

Keep belt costs *down* by specifying Gates Vulco Rope Drives—the V-Belt with *concave sides*. Belts you need are readily available from nearby distributor stocks. The Gates Rubber Company, Denver, Colorado—*World's Largest Maker of V-Belts.*

Gates Engineering Offices and Distributor Stocks are located in all industrial centers of the United States and Canada, and in 70 other countries throughout the world...

TPA 25-B

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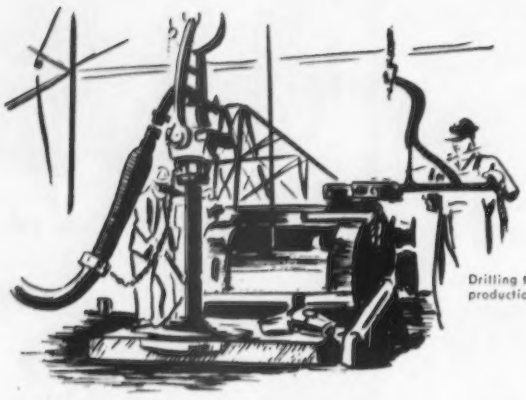
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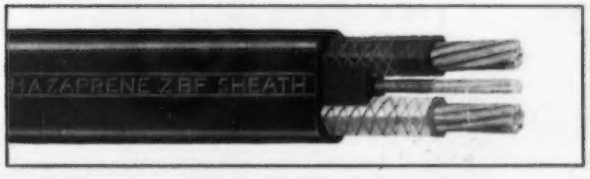
tonic for a tired shuttle car

The shuttle car is just about the hardest working machine in a coal mine. It's a glutton for punishment and for cable, too. The fate it hands out to cable is cruel—a succession of run-overs and almost constant abrasion. But, tough as a shuttle car is, there is nothing more "beat" than one that's suffering from beat-up cable.

It's different, however, with Hazacord Red Saddle Hex-Tite Shuttle Car Cable on the job. Hazacord's Hex-Tite design prevents internal slipping and rotation, forms a solid locked-tight construction that makes Hazacord the match for any shuttle car. And the Red Saddle pre-formed protective wall of neoprene assures a uniform fill between conductors . . . positive protection against short-circuiting due to run-overs.

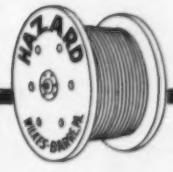


Hexagonal insulation provides six plane surfaces to lock with the Hazaprene ZBF sheath and bonded Red Saddle, preventing internal slipping and rotation. Heavy reinforcing cords, embedded in both insulation and sheath, are an additional guard against pulling and a special adhesive completes the bonded construction.

Hazacord's heat-resistant insulation, bonded to the extra-flexible conductor, permits high operating temperatures. The Hazaprene ZBF sheath is cured under pressure in a continuous metal mold to assure: *1. optimum vulcanization; 2. maximum density; 3. lasting toughness; 4. smooth, wear-resisting surface; 5. resistance to mechanical abuse; 6. controlled diameter.*

Hazaprene sheaths are flexible and unaffected by oils, acids, alkalies and mine water.

Write for Bulletin H-450, the Hazard Mining Cable Catalog, for information on the cables that are a match for any shuttle car. Hazard Insulated Wire Works, Division of The Okonite Company, Passaic, N. J.



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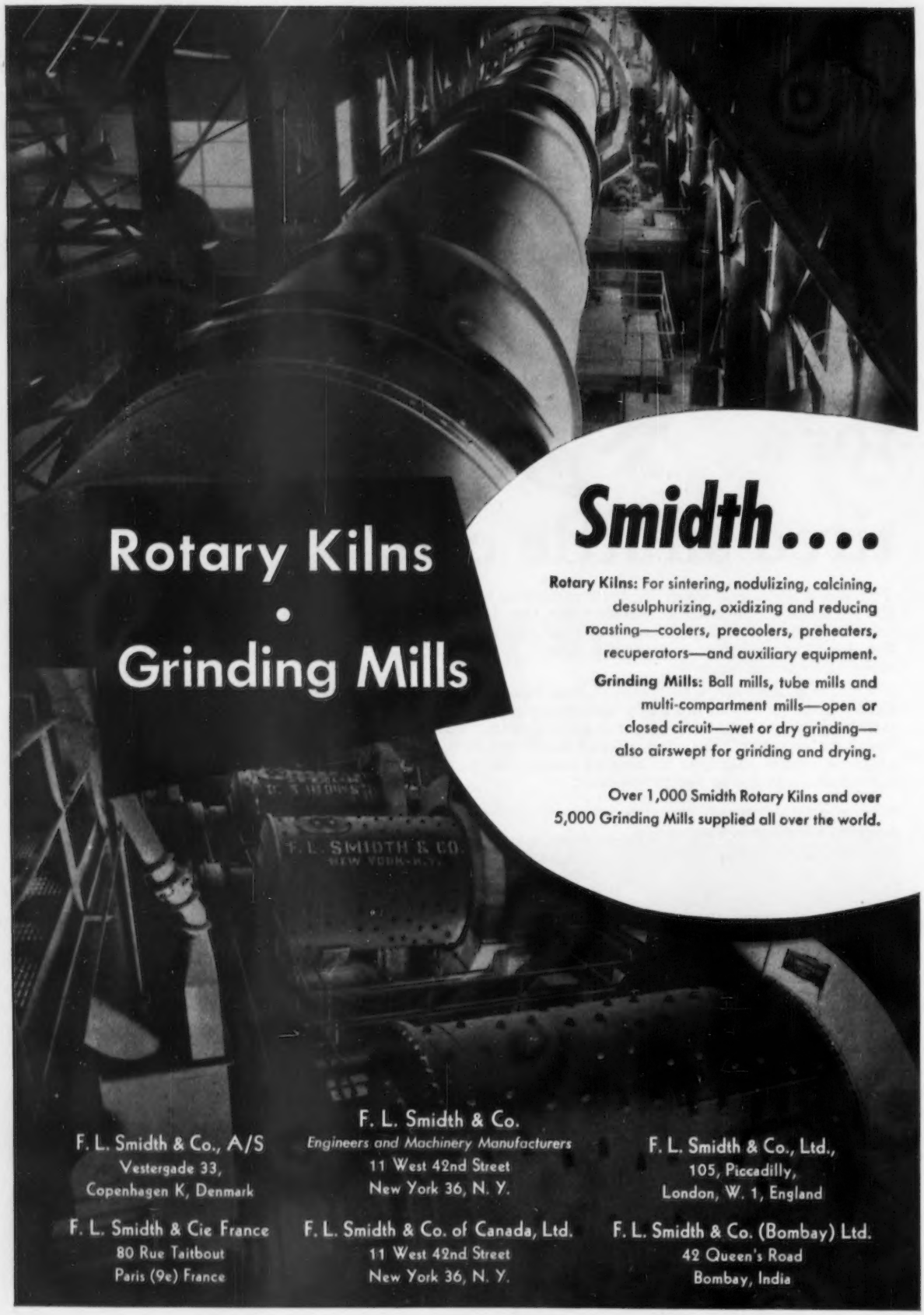

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Michigan Turbo-Dozer in open pit copper mine

Report on the MICHIGAN TURBO-DOZER:

New dozer features 27 mph speed, power-tilting bowl, rear-wheel steer

The new 2¾ yd. capacity Michigan Turbo-Dozer combines rubber-tired speed and mobility with outstanding traction and power. Its turbocharged diesel engine develops 165 hp, with maximum rimpull of 28,000 lbs. At 27 mph, it runs rings around any dozer on the market! The Turbo-Dozer can cover assignments from one end of the mine to the other. It runs on rubber from one job to another—shovel clean-up, dump, road maintenance jobs, cable relocation, miscellaneous towing.

Exclusive power-tilting bowl. A powerful double-acting hydraulic cylinder tilts the bowl back and forth through a 33 degree arc. With your right hand on the bowl-control lever, you can change the bowl angle from "dig" to "float" as you travel—precision control to maintain the grade. You can hook the cutting edge under tough rock or obstructions—work it up and down to root them out. If the front wheels have any tendency to rise, you can tilt the bowl back to build up the load weight *on* the bowl and front wheels.

High flotation tires, oscillating axle. Big 18.00-25 low pressure tires (nearly 7-foot tread) give the Turbo-Dozer excellent ground contact in dry, wet or sandy footing. You can cross railroad tracks or travel along the ties or road bed. On uneven terrain the steering-drive axle oscillates to keep both rear wheels in firm contact with the ground. With 14½ inches of ground clearance underneath, it's practically impossible to get "hung up".

Full traction while turning. The Turbo-Dozer gives you full tractive effort even in a turn. All four wheels are always driving, except when you declutch the rear axle for highway travel. Rear-wheel steering eliminates unnecessary tire wear —you don't brake or drag your inside wheels on a turn. If one wheel begins to slip, a locking differential automatically applies power to the wheel with the firmest footing.

Power-shifting, 300% torque multiplication. Clark's exclusive power-shift transmission eliminates the conventional engine clutch and foot pedal—the most notorious cause of excessive maintenance and operator fatigue. With two finger-tip levers on the steering column, the operator can instantly shift between High-Low and Forward-Reverse—even when moving in either direction—for fast in-and-out passes.

The 3-to-1 Clark torque converter gives you a steady power flow, regardless of speed. As the load gets heavier the torque output automatically increases up to 300% at stall speed—gives you the extra torque to plow through the toughest spots. You can't stall the engine, and there's no clutch to slip.

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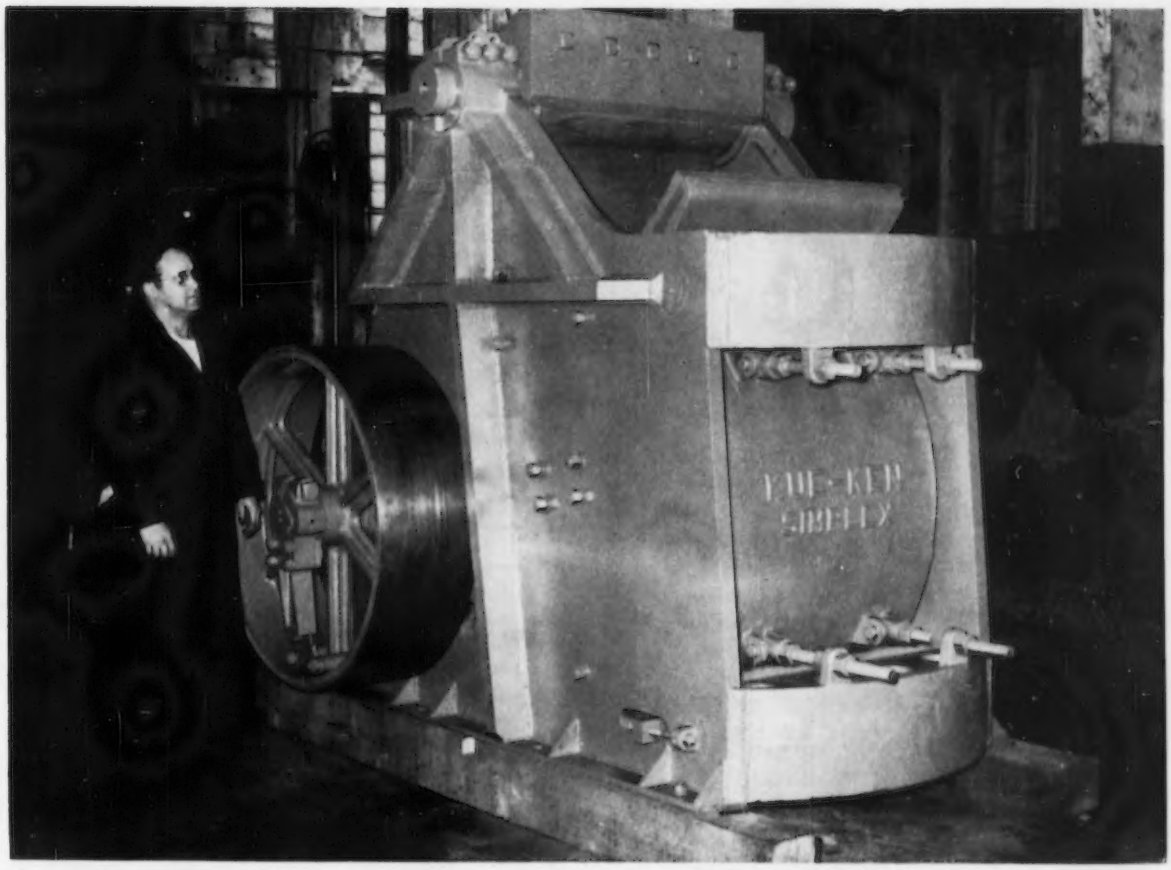

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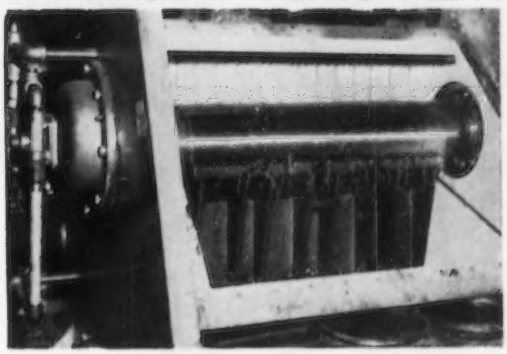

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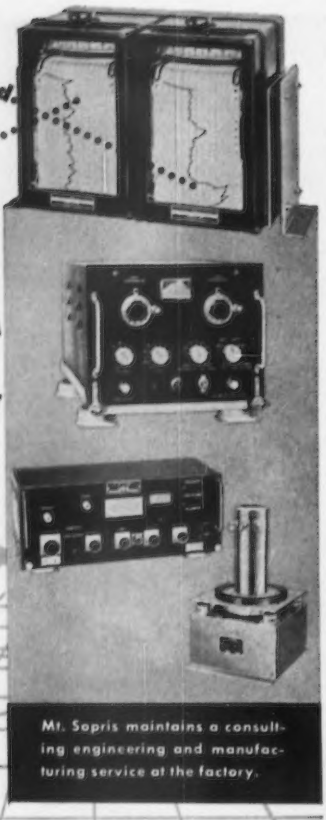

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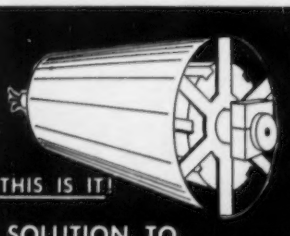

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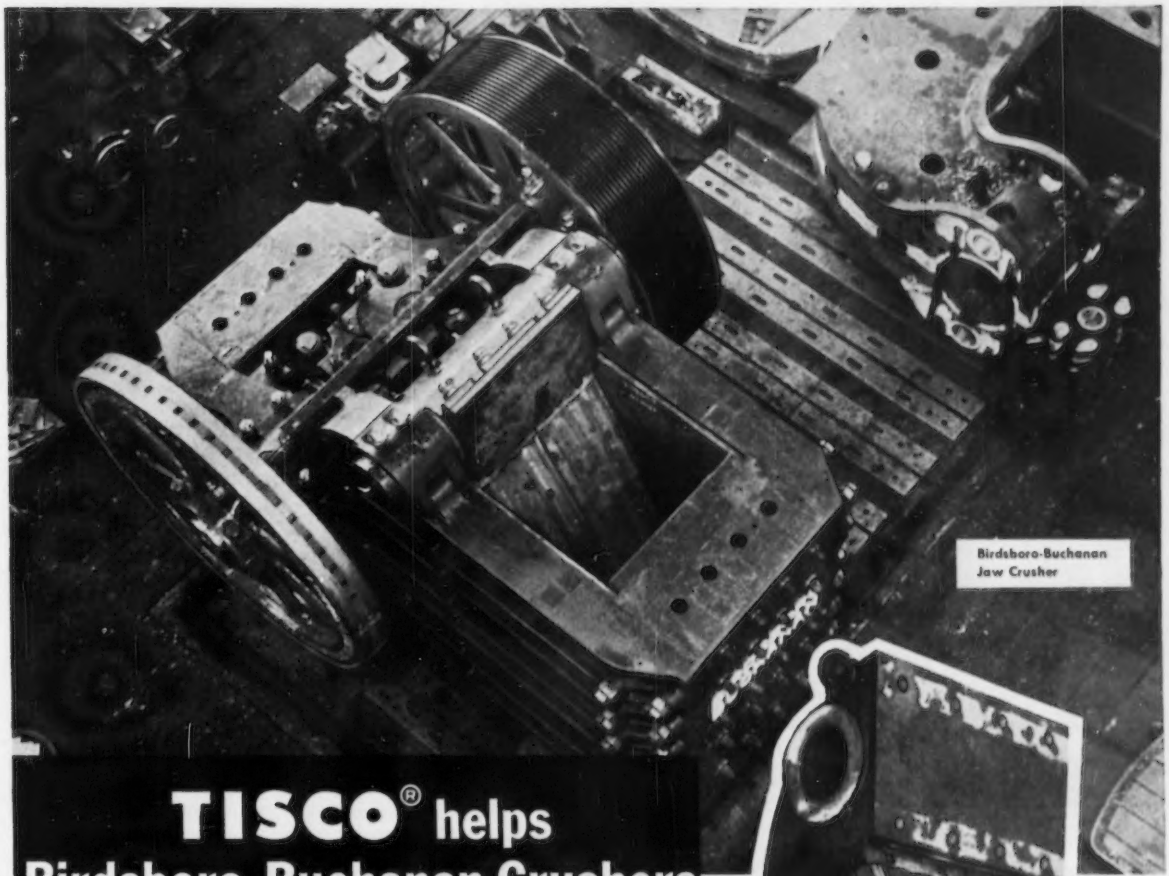

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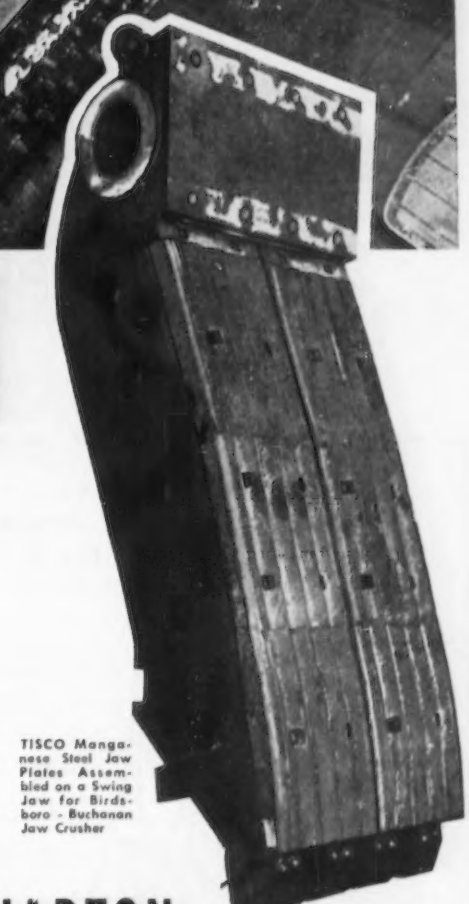
Jaw plates of TISCO Manganese Steel are used in Birdsboro-Buchanan Crushers because of the extraordinary property of this material of developing an extremely hard, abrasion-resistant surface in use under impact. This assures greater production with less down-time for replacement, indicating the value of TISCO Manganese Steel both for original equipment and for replacement parts.

Taylor-Wharton has made a specialty of alloy steels to resist impact and abrasion. Among the newer alloys developed by this company are TISCO 150-Y, a high chrome cast iron that can be heat treated to 700 Brinell, and TISCO 50. The latter is a heat hardenable medium manganese chrome molybdenum steel capable of hardness from 300 to 500 Brinell. Both alloys are strongly resistant to abrasion, where heavy impact is not present.

If your problem is one of impact or abrasion, or a combination of both, get in touch with us. When ordering replacement wear parts, order from manufacturer of the equipment and specify TISCO Alloys.



TISCO Manganese Steel Jaw Plates Assembled on a Swing Jaw for Birdsboro - Buchanan Jaw Crusher

Use TIMANG Weld Rods and Shapes for rebuilding and repairing wear parts.

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(Division of HARRISBURG STEEL CORPORATION)

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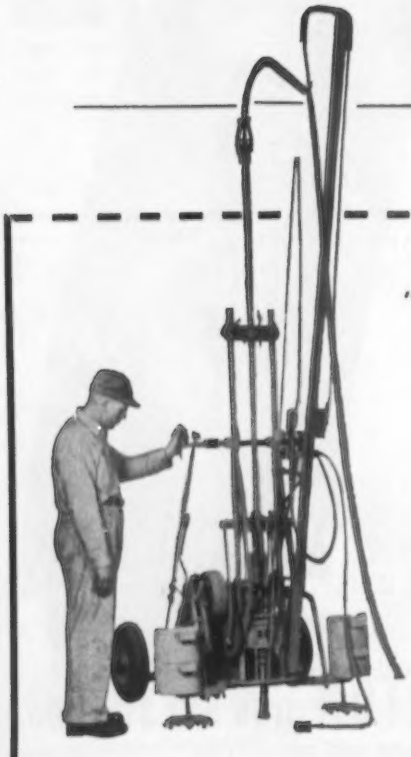

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Get all the facts . . . write today for illustrated bulletin giving full details.

Manufactured By:

HOSSFELD MANUFACTURING COMPANY

440 W. Third Street, Winona, Minnesota

Cut Your Haul Costs With This High-Speed, Big-Capacity ATHEY-CAT Rear Dump Team

Athey-Cat Rear Dump Haulers make more trips per hour . . . move more yards per day . . . net more profits per job! Here's how they do it: the PR21 Trailer has a big 14′ x 9″ target for fast-swinging shovels, reducing loading time. 9′ 5′ is the loading height . . . low enough for loading in tunnels and to keep the shovels working at maximum production. And you don't have to "take it easy" with the PR21, because it's built to take the shock of falling rock and the twist of high-speed going over rough roads. All-welded, hi-strength steel box-type body with triple-ply bottom, cushions and absorbs the shock.

The PR21-DW21 Team hauls a 31-ton load at 25.1 m.p.h. Positive, hydraulic steering permits the Athey-Cat Team to make short turns and spot the load right where you want it. Fast, 3-stage hydraulic rams dump the load cleanly and quickly.

For lower costs and increased profit at your mine, have your Athey-Caterpillar Dealer show you all of these PR21 advantages. There are many more! See him soon.

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- Provides accurate radiometric assay in minutes instead of hours.
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- Maximum assay time, only 3 minutes.
- Weighs 12 pounds; measures 4½ x 10¾ x 8¾ inches.

A compact, rugged field tested and scientifically designed instrument complete with batteries, warranty and instruction manual.

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McNally Pittsburg NiHard iron is used for long wear service in slurry pumps and valves. NiHard parts are cast and ground to close limits, to your specifications. For NiHard cast iron parts, write to McNally Pittsburg.

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McNALLY PITTSBURG

MANUFACTURING CORPORATION

OFFICES: 307 North Michigan, Chicago, Illinois
First National Bank Bldg., Pittsburgh, Pa.

PLANTS: Pittsburg, Kansas Weliston, Ohio

We have a house to put in order...

WE HAVE A HOUSE to put in order . . . and it's the house where America lives.

Of our country's many million homes, more than 1 out of every 10 are out-and-out slums. Nearly one-half of all American dwellings are in poor to "fair" condition, and urgently need basic repairs.

Something *must* be done—both to correct the slums of today and *prevent* the slums of tomorrow.

How do slums start? Usually just one house starts to slide downhill and soon a whole block changes. Pride is lost. Other houses are neglected, decay spreads.

So the 20 million homes in need of basic repair and improvements deserve equal attention. The time to stop the spreading blight of slums is *before it starts.*

What's your stake in stopping slums?

If you think your town is different, just look around you . . . If you think slums only affect persons who live in them, think again.

Slums raise taxes and lower property values of the whole town. They raise rates of crime, delinquency and disease. *Everyone* has a real stake in stopping slums. *Area that includes you as a businessman.*

Your firm is certainly dependent on the welfare of the community where you do business. But it's more than good business—it's good citizenship to take part in efforts aimed at civic improvements. It's the *responsibility* of every business.

What can your firm do? The answer to America's housing problems starts with individuals. But to roll back slums is such a big job it's going to take more than individual effort. It will need the cooperation of your business and many others.

Some slums should be torn down and a fresh start made. Others can be remodeled and made to conform to better living standards. So it is up to you to support every sound program which seeks adequate housing for all our people.

New help is now available

There is a new national, non-profit organization called A.C.T.I.O.N.—The American Council To Improve Our Neighborhoods—which is designed to help all individuals or groups interested in putting America's house in order.

Send for a free copy of "ACTION." It explains what A.C.T.I.O.N. is and proposes to do. It lists booklets, research, check-lists, and other material which can help you. Address P. O. Box 500, Radio City Station, New York 20, N. Y.

ACTION

American Council To Improve Our Neighborhoods

WEST END...

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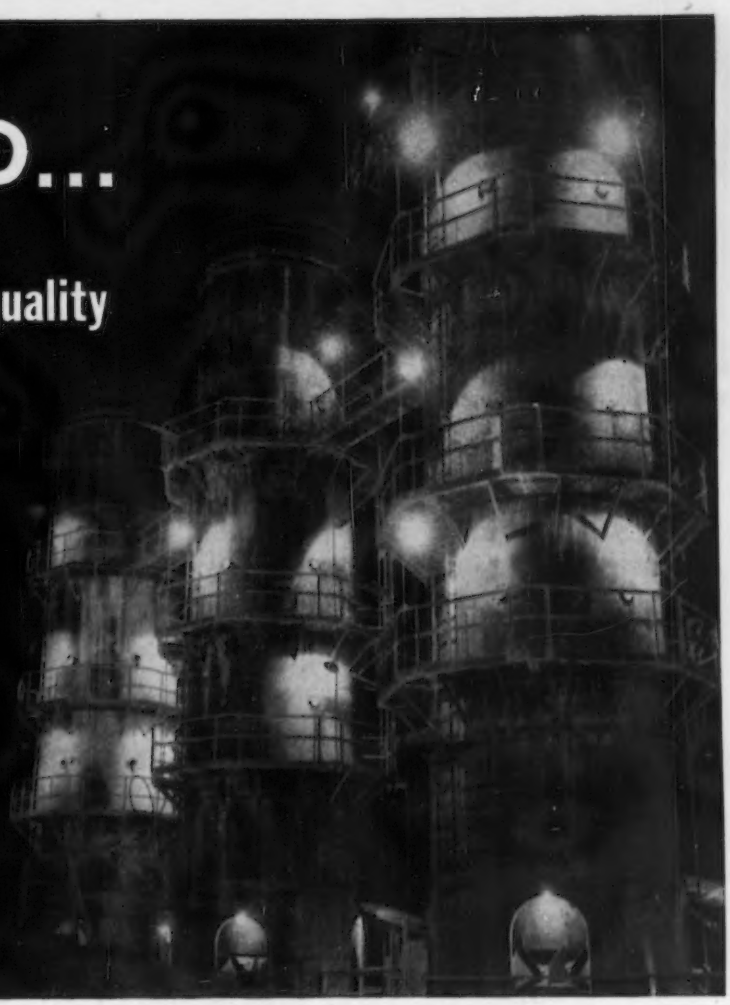

Giant kilns burn lime and coke to make carbon dioxide. This gas is used to separate the soda ash base from the brine that is pumped in from the natural deposits of Searles Lake in the California desert. The burned lime by-product is conveyed to a special plant where it is processed into hydrated lime—another product of West End Chemical Company.

The manufacturing, storage and shipping facilities of West End are constantly at work for western industry. This continuous operation provides ample soda ash to supply both immediate requirements and maintain a vast reserve. Regardless of market conditions, West End meets all normal and emergency needs of western industry promptly. Strategic location of plant permits fast, economical transport by rail or truck to any point in the West.

Write for samples, prices and technical data.

WEST END CHEMICAL COMPANY

SODA ASH • BORAX • SODIUM SULFATE
SALT CAKE • HYDRATED LIME

PERSONAL SERVICE — Customers anywhere in the West are only a few hours away by company plane.

IMMEDIATE SHIPMENT to customers throughout the West in company's own leased hopper cars . . . ready at all times.

30 MINUTE IN-AND-OUT LOADING for bulk trucks at any hour of day or night through "serve yourself" delivery.

West End Chemical Co.

Executive Offices: Nineteen Fifty-Six Webster Bldg., Oakland 12, California · Plant: Westend, California

EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant
Positions Wanted
Part Time Work

Civil Service Opportunities
Selling Opportunities Wanted
Selling Opportunities Offered

Employment Agencies
Employment Services
Labor Bureaus

DISPLAYED —RATES— **UNDISPLAYED**

The advertising rate is $16.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

Subject to Agency Commission.

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to Agency Commission.

Send NEW ADS to ENGINEERING & MINING JOURNAL, 330 W. 42nd St., N. Y. 36, N. Y., for December issue closing November 21st

DESIGN ENGINEERS

Permanent Opportunities With McKEE

IN OUR REFINERY, METALS OR INDUSTRIAL DIVISIONS AT OUR CLEVELAND, OHIO OFFICES

McKee with more than 50 years of successful operation, doing business all over the world; is one of the largest, oldest and best known engineering and contracting firms in the business. The McKee organization continues to grow and expand, thereby offers many present and future opportunities for qualified and experienced engineers and designers in the following fields:

Piping
Structural Steel
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Equipment Specs.

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Applicants should have at least five years' of experience.

Here is a rare opportunity for you to utilize your engineering abilities and talents.

McKee offers top compensation commensurate with experience and ability. No age limitations.

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Edward A. Kolner

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Designing Engineer for crushing and rock and ore processing machinery with working knowledge of complete plant layout. Long established eastern manufacturer. Unusual opportunity for remuneration and advancement. Location choice between New York City and medium sized eastern city.

P-7074, Engineering & Mining Journal
330 W. 42nd St., New York 36, N.Y.

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Nation wide recruitment through 54 offices of the National Ass'n of Personnel Consultants at no charge to the employer. The Pacific Northwest's leading employment firm.

ACME PERSONNEL SERVICE
P.O. Box 132, Dishman Branch, Spokane, Wash.

PROJECT ENGINEER WANTED

Graduate Mining, Metallurgical, Chemical or Mechanical Engineer, preferably 25 to 35 years old, wanted by medium size progressive heavy machinery manufacturing company located in Southeastern Pennsylvania. To assist in design and preparing for market of various lines of equipment used in mineral dressing, heavy chemical, cement and rock products industries. Must have had engineering and field experience, and be willing to work on drafting board, travel and do field service. Opportunity also exists for a properly qualified individual, eventually to become a sales engineer. Salary open.

P-7533 Engineering & Mining Journal
330 W. 42nd St., New York 36, N. Y.

CHIEF GEOLOGIST—MINERALS

15 to 25 years experience in field exploration and mine examination. Must be competent negotiator; have ability to handle people and substantial experience in economic analysis and evaluation. Excellent opportunity to take charge of exploration department for successful domestic mining company and become member of management team. Oil and gas geological experience also desirable. Salary open. Send detailed resume. Confidential.

P-7866 Engineering & Mining Journal
330 W. 42 St., New York 36, N.Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

Mine Master Mechanic for underground shaft metal mine, Southeast, 1000 tons per day. Should be competent supervisor with practical ability to operate and maintain surface and underground equipment. Give full details, education, experience and salary requirements. P-8095, Engineering & Mining Journal.

Junior Metallurgist, to perform control work and ore dressing research in a 5000-ton magnetic-gravity-flotation mill. Excellent opportunity for recent graduate to learn many phases of milling. Location northeast. Salary open. P-7677, Engineering & Mining Journal.

Applications are invited for the position of assistant mill superintendent at a large base metal mine in South West Africa. Applicant should be a technical graduate and must have had at least five years base metal flotation experience. Company offers three year contract, transportation for self and family, and salary while traveling. House furnished with heavy furniture available for married man. Climate and living conditions excellent. P-7728, Engineering & Mining Journal.

Wanted shaft and tunnel sup't. Exp. in estimating and shaft and tunnel design. P-8085, Engineering & Mining Journal.

Safety Director, under age 45, Industrial safety experience necessary, mining experience desired. Write giving resume of experience, references, salary expected. P-8115, Engineering & Mining Journal.

Mining Engineer, B.S. in mining or mining geology, experience not essential. Work in connection with open pit operation located in Eastern U. S. Salary open. P-8146, Engineering & Mining Journal.

(*Continued on opposite page*)

OPENINGS AVAILABLE AT LONG ESTABLISHED MEDITERRANEAN COPPER PROPERTY

ASSISTANT CONCENTRATOR SUPERINTENDENT

Age limit about 45. Must be graduate metallurgist having operating experience and with aptitude and experience in laboratory research and process development. Heavy sulphide ore experience desirable. Qualified to succeed to superintendency.

ASSISTANT MINE SUPERINTENDENT

Age 30-42. Must be tactful and adaptable. Require man with excellent mining engineering training. Some operating experience necessary.

ASSISTANT CHIEF ENGINEER

Age limit 45 preferably about 35. Must be graduate mechanical, chemical or civil engineer with natural mechanical ability excellent practical and supervisory and some construction experience, for charge under Chief Engineer of all shops, foundry, mobile equipment including loading, marine, railway and construction; maintenance and repair of all types of equipment; 7250 KVA diesel generating plant.

Forward with initial reply complete educational and experience records, list of references, age, marital status, number and age of children, photo (optional). Company offers three year contract, furnished house, transportation self and family, liberal vacations. Excellent climate, living conditions, medical and hospital facilities. School to 14 years. Non-contributory pension plan. Salary open.

P-6781 Eng. & Mining Journal
1111 Wilshire Blvd. Los Angeles, Calif.

EXPLORATION ENGINEERS

MINING ENGINEERS

We have opportunities for engineers with experience in open pit mining operations, including estimating extent of iron ore deposits and related engineering work such as maintaining pit operational plans, sampling, surveying and the layout of construction projects.

Excellent living conditions and benefits. Mine located in desert area of Southern California. Send complete resume with salary requirements to Employment Manager.

KAISER STEEL CORP.
P. O. Box 217, FONTANA, CALIF.

GRADUATE MINING ENGINEER

Age 50, good health, married, 3 children, fluent Spanish, 27 years operational and exploration experience. Familiar with all phases of mechanization as applied to underground mining. Have good record of low costs. Desires position of responsibility.

PW—7693—Engineering & Mining Journal
68 Post St., San Francisco 4, Calif.

SEARCHLIGHT SECTION

(Classified Advertising)

BUSINESS OPPORTUNITIES — EQUIPMENT - USED or RESALE

UNDISPLAYED —RATES— *DISPLAYED*

$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

The advertising rate is $13.80 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

Send NEW ADVERTISEMENTS to N. Y. Office, 330 W. 42nd St., N. Y. 36, N. Y. for December issue closing November 21st

POSITIONS VACANT

(Continued from opposite page)

President—capable experienced executive and competent negotiator to head exploration program Western United States with two field crews. Substantial expansion planned. We would like to hear from company officers who feel they might better their futures. Please provide full details of past record which will be held confidential subject to your own release, and salary required. P-8046, Engineering & Mining Journal.

Applications are invited for the position of Assistant Mine Superintendent at a large base metal mine in South West Africa. Applicant should be a technical graduate and must have had at least five years varied mining experience in basic metal mines. Company offers three-year contract, transportation for self and family, and salary while traveling. House furnished with heavy furniture available for married man. Forward reply, giving age, education, experience record, references and marital status to: P-7997, Engineering & Mining Journal.

Mining Engineer or Field Geologist, energetic, young and capable of independent field examinations in conjunction with operating Open Pit Mine. Expanding company offers excellent opportunities for advancement. Single men preferred on three year contract. Salary open. Location Malaya. P-7971, Engineering & Mining Journal.

Investment group seeks a young geologist or mining engineer to investigate properties. Permanent position, good salary. Must be competent in writing reports and free to travel. Reply with complete resumé. P-8176, Engineering & Mining Journal.

POSITION WANTED

Metallurgist, 31, B. Met.E., M.Sc. Development, operating, administrative experience in base metals milling. Development experience in hydrometallurgy and mon-sulfides. PW-7964, Engineering & Mining Journal.

LEGAL NOTICE

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP MANAGEMENT, AND CIRCULATION OF ENGINEERING AND MINING JOURNAL published monthly, with add'l issue in mid-June at Philadelphia, Pa. for October 1, 1955.

1. The name and address of the publisher, editor, managing editor, and Business manager is: Publisher McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 36, N.Y.; Editor Alvin W. Knoerr, 330 West 42nd Street, New York 36, N.Y.; Managing editor, George P. Lutjen, 330 West 42nd Street, New York 36, N.Y.; Business manager, Raymond H. Smalley, 330 West 42nd Street, New York 36, N.Y.

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McGRAW-HILL PUBLISHING COMPANY, INC.
By J. A. GERARDI, Vice Pres. & Treas.

Sworn to and subscribed before me this 15th day of September, 1955.

[SEAL] ELVA G. MASLIN

(My Commission expires March 30, 1956)

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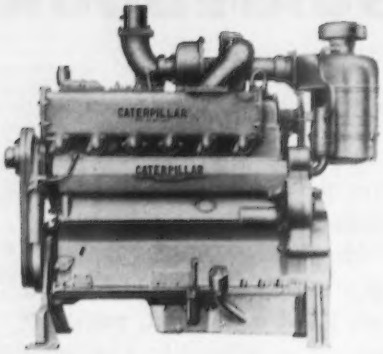

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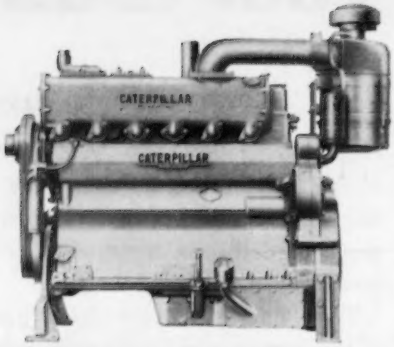

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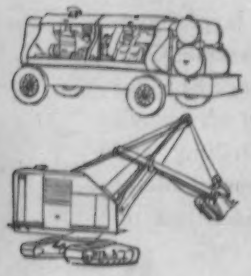

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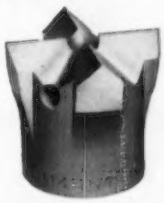

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